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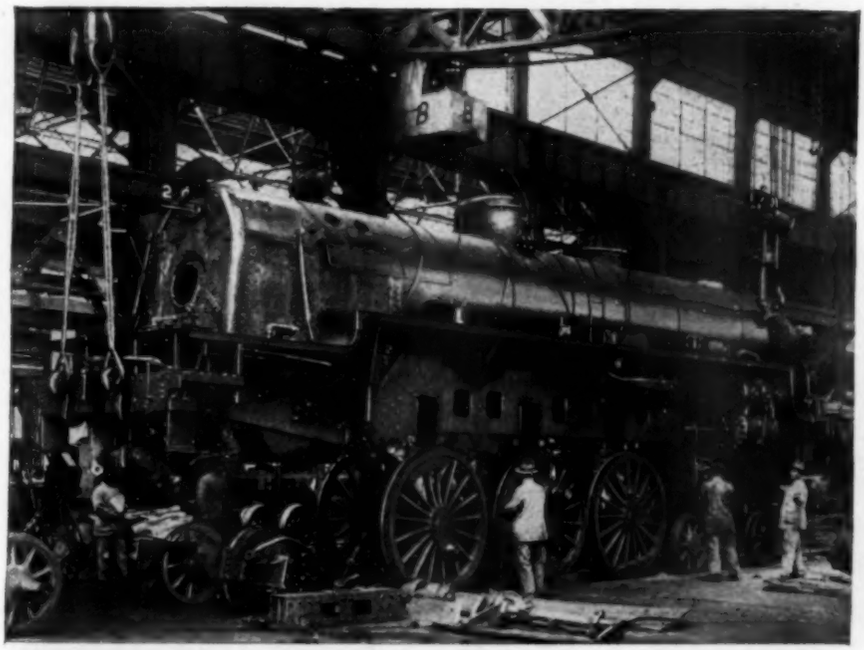
Scheduling Locomotive Repairs in a Japanese Shop



A locomotive is lifted off its wheels in less than three hours after it enters the shop

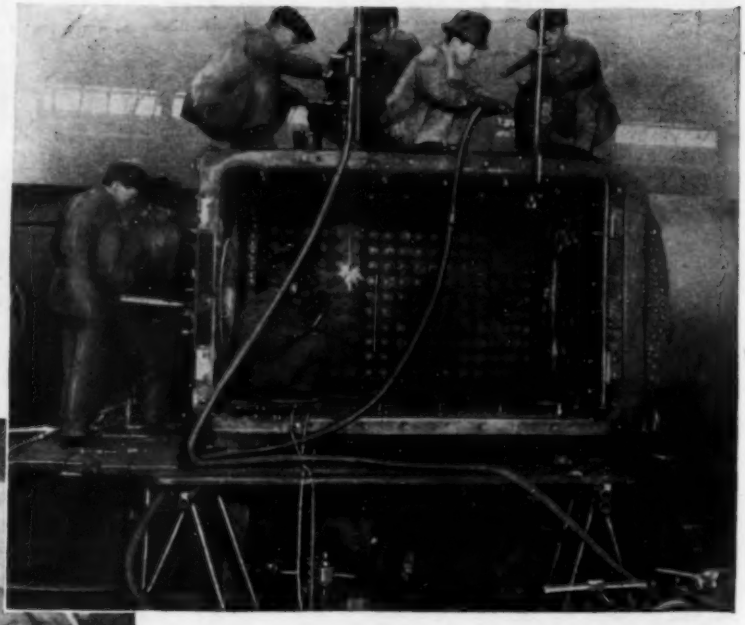
By Fred H. Colvin
Editor, American Machinist

A careful study of operations involved, improved methods, and modern equipment, adopted during a period of seventeen years, have cut the time of shopping from thirty days to five, with an actual reduction in personnel

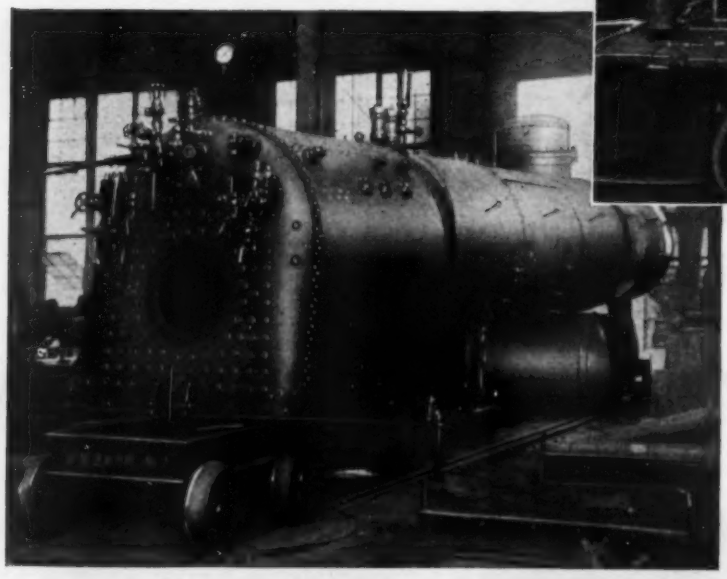
CUTTING the time required for a general overhaul of locomotives from thirty days to five is noteworthy any time, anywhere. This achievement, according to Okiiye Yamashita of the Imperial Government Railways in Japan, has been accomplished during the past seventeen years by a careful study of the operations involved, by improving methods, and by securing co-operation in the shops. Such reduction is the result of gradual improvement all along the line. Ten years ago, for example, the time required was ten days instead of the present five.

Not only has the time required for shopping been reduced, but by improved methods, the amount of labor involved has also been decreased despite the increasing size and weight of locomotives. This labor cut is attributed to new machines, to better shop management, and to a system of scheduling in which every kind of repair work, no matter how minute, is so scheduled that it can be worked out in the same time as the other operations. This system is known as "parallel operations." It prevents a locomotive being held in the shop because some one repair operation lags behind the rest. This can be accomplished only by a detailed study of different operations and the time required by each, and by a planning of the work and the shop equipment so that each department can do its part in a specified time. Such a system requires harmony and co-operation, rather than rivalry between departments, in order to be successful.

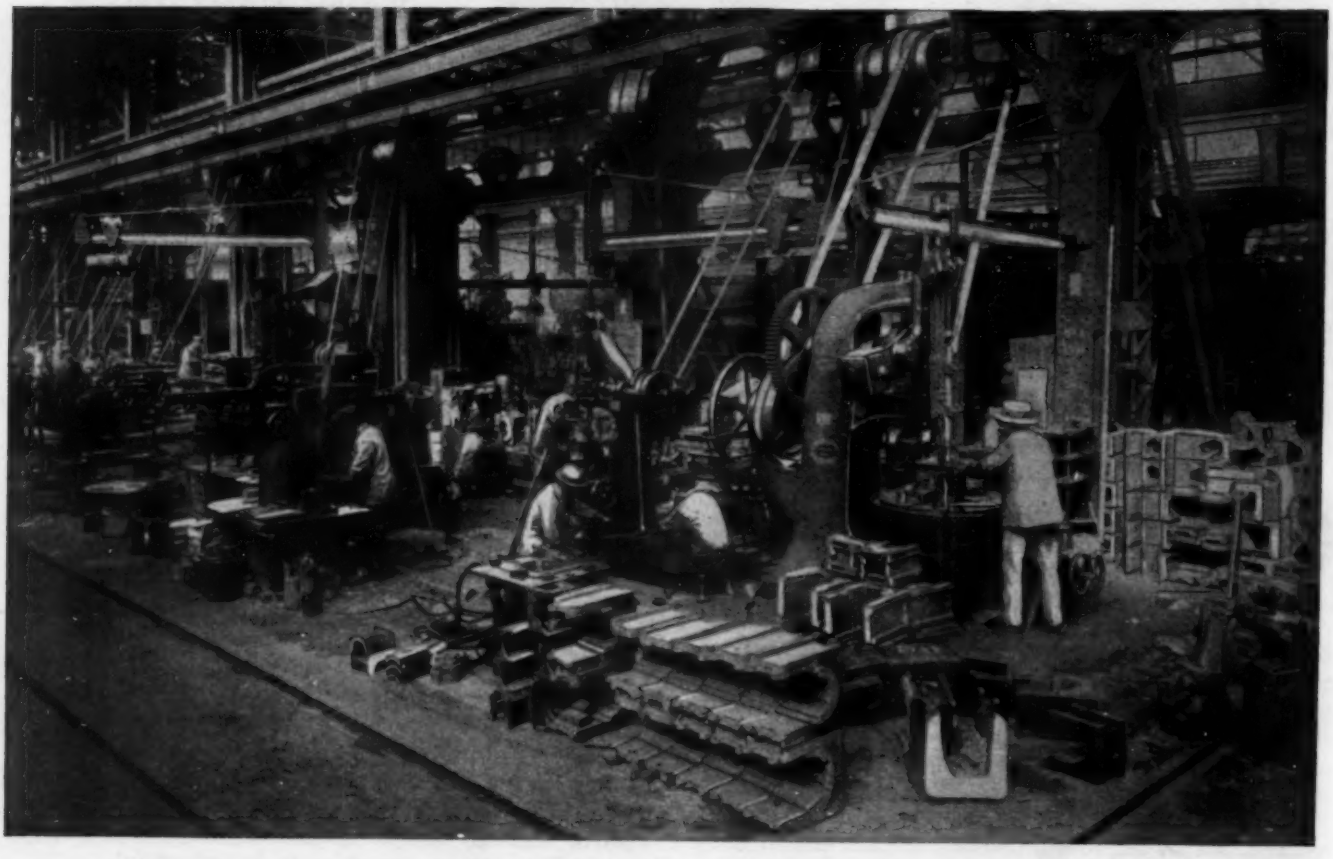
Boiler repairs are begun by drilling out and cutting off staybolts, using the regulation "old man" and air-driven tools. As many men as possible are concentrated around the fire box. The torch is used to cut out a section of the crown sheet

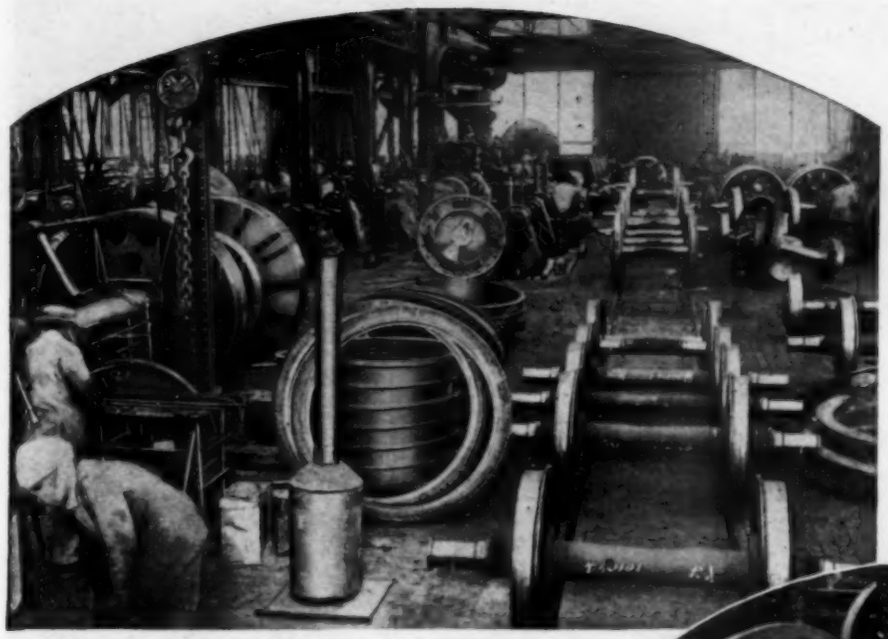


In transferring the boiler to the boiler shop, the front end is mounted on a special truck carrying two air reservoirs and an air motor, making the outfit self-propelling, independent of either air lines or electricity



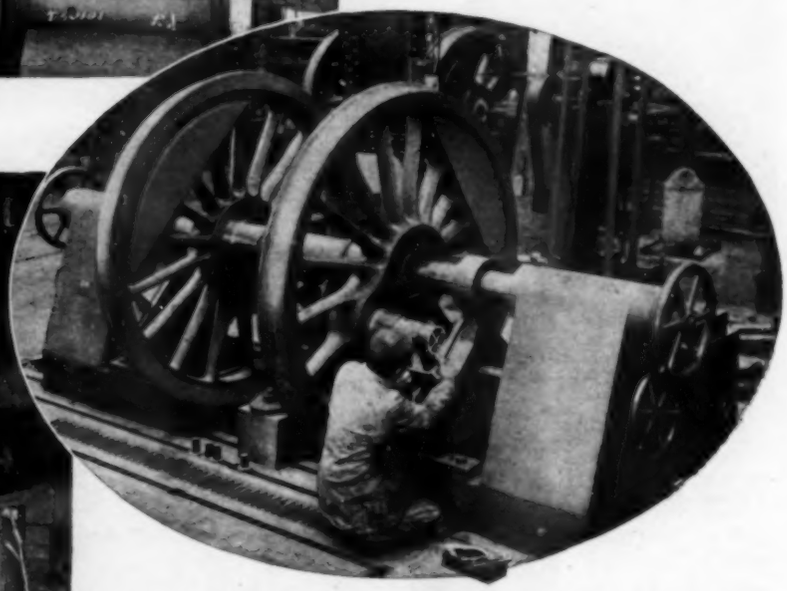
A corner of the machine shop. In the right foreground, old crown brasses are being cut out on a slotter before the driving boxes are sent to the foundry for new brasses. Following usual practice, the brass is divided, and the parts are then forced out of the box

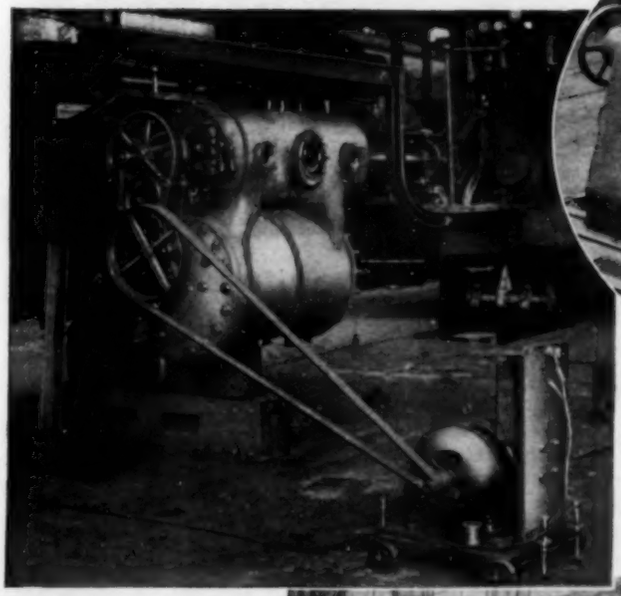




All wheel work is segregated in this shop. Two wheel lathes of American make are found in this department. Tires are removed by revolving the wheel on its axle through the flame of a single gas torch

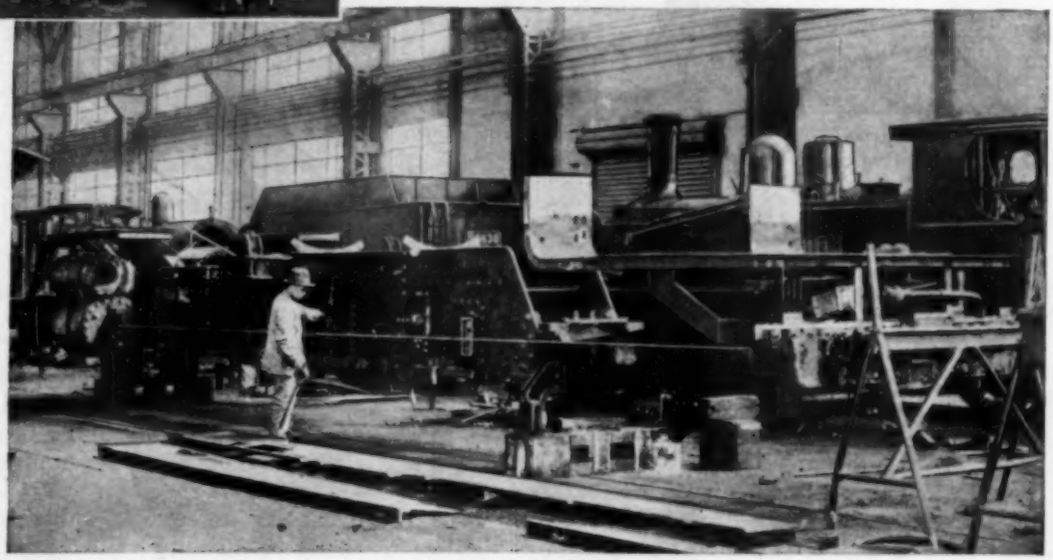
Great care is taken to check the crankpin angles in this modern quartering machine

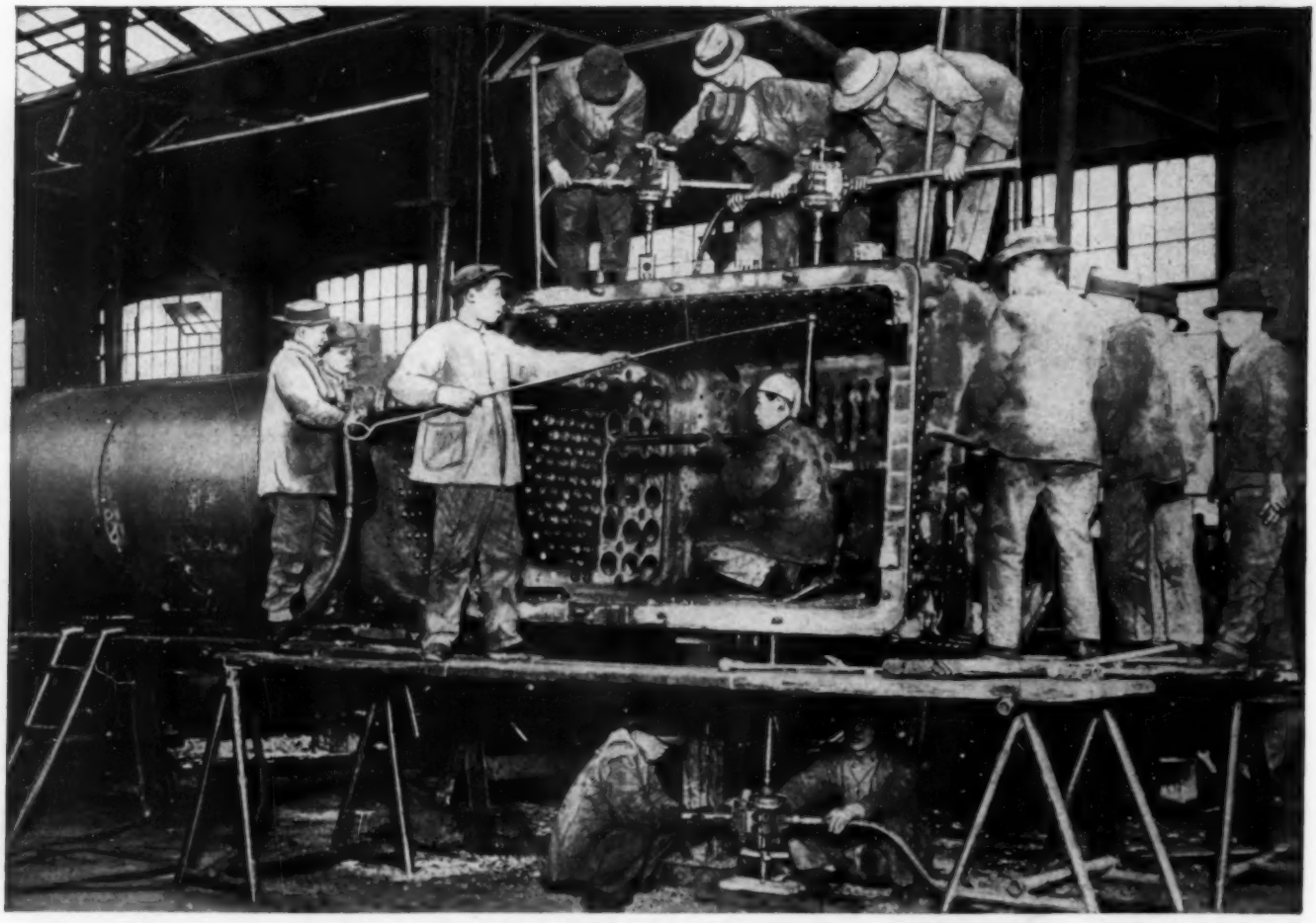




The picture to the left might have been taken in an American railway shop. It shows a portable unit for reboring the piston valve chamber, driven by belt from a portable electric motor

Before the driving wheels are replaced, the alignment of the frame and of the pedestals, or horn blocks, is checked by means of a line stretched through the cylinders





Threading of staybolt holes, heading of flues in the firebox sheet, and other operations are being carried on by the fourteen men grouped around the end of this boiler

The accompanying illustrations tell the story of how the work is handled. As many men as can work efficiently together are detailed to various jobs, the main object being to get the locomotive back into service in the shortest time possible, with the work being done properly. First, the front end and fire box are washed out with a water jet; then the rods and valve links are dismantled. In the meantime the cab is released and pulled off; in less than three hours the boiler and frame are lifted off the wheels. Here again the work of stripping goes on during the lifting operation. Springs and driving boxes are removed while the wheels are on the track, after which the greasy parts go to a hot soda bath. When they come out of the soda, they are washed off with a hose which also cools them so that they can be readily handled. The rods and other parts that have been washed are then inspected for cracks and other defects by painting them with whiting in the regulation manner.

In the boiler tube shop are machines for scarfing the ends, electric welders, and tube-stretching machines. Stretching the tubes aids in removing the scale and eliminates the welding of safe ends

Meanwhile, the boiler is dismounted from the frame and sent to the boiler shop. Instead of being carried by a crane in the usual way, it is mounted on two special trucks. The front truck carries two good-sized reservoirs, or drums, that contain compressed air to drive an air motor geared to the axle. This motor furnishes the power necessary to propel the boiler into the boiler shop, independent of outside motors.

At the start of the boiler repairs, staybolts are drilled out and cut off, injured parts of crown sheet are cut out with a gas torch, and other dismantling operations carried on. As many as seven men work at the firebox end together. At the other end of the boiler, the men remove the large smoke tubes, using a cross bar in the smoke box to support them while taking them out.

Worn crown brasses are cut out on a slotter, and the driving boxes go to the foundry for new brasses. The slotter is of English make, as are most of the older machines in the shop. Among the more recent acquisitions are both American and European machines, with a goodly sprinkling of equipment built in Japanese shops.

Driving, truck, and trailer wheels are segregated in one department where tires are re-turned or removed as may be necessary. Two American wheel lathes are found in this department. The tires are heated at the base of the flange by a gas torch in order to harden them against wear from the short radius curves on the mountain lines. The mounted wheels revolve slowly on a special stand, and a man at each wheel operates a torch so as to heat the tires as they revolve. Another interesting operation in this department is the method of peening the tire retaining rings in place. Two pneumatic hammers are mounted on a stand so that, when the wheels revolve with their axles, these hammers reach the metal just outside the retaining rings, peening them tightly in place. The rings are removed by cutting them out in a wheel lathe when it is necessary to remove the tire for replacement.

Particular attention is paid to the angle of the crankpins, this being carefully checked on a modern quartering machine every time the wheels go through the shop on a general repair order. Piston valve chambers and cylinders are rebored with portable boring bars of the usual type, driven by belt from a portable electric motor mounted on the floor. The motor is carried on a wheeled truck with the controller mounted on an upright. Threaded studs at each end of the truck body raise it off its wheels and prevent movement caused by belt pull.

To insure alignment before the locomotive is re-erected, the frame is checked by a line stretched through the cylinders. At the same time the alignment of the horn blocks, as the pedestals on this type of frame are called, is also carefully checked. The type of slab frame used differs from our own, as these locomotives are designed along British lines. Piston rod alignment is also checked on the surface plate while the piston and extension rod are supported on V-blocks. Valve gear and piston valve parts are overhauled in a special department; the main connecting and side rods are handled on steel rail horses. At this time the brasses are fitted, and the rods made ready for the erecting gang. Convenient jib cranes make it easy to handle the rods. When the various wheels and axles are ready they are placed on the erecting track ready for the boiler and frame to be lowered into place. Blocks on the rails hold the wheels correctly in position.

In the meantime, the boiler is thoroughly repaired in the boiler shop. The flue department has some ingenious equipment for scarfing the ends of the tubes, and the electric welding machines for welding on the safe ends are of their own design. These machines both weld the joint by the resistance method and roll the flash of the weld even with the tube before it cools. There is also a tube-stretching machine that grips a 14-ft. tube at each end and lengthens it 8 in. to avoid the necessity of welding on a safe end. This process reduces the wall thickness to some extent, but the practice has been found advantageous when used judiciously. Incidentally the stretching is quite effectual in removing any scale on the tube as it separates from the metal during the 8-in. stretch. In this department, also, as many men as possible are concentrated on one boiler. In one instance, fourteen men were grouped around the fire box end. Some were threading staybolt holes, others heading flues in the fire box sheet and performing similar operations, air-driven tools being used exclusively. Some of the tools are of American manufacture, others not.

Before being remounted on its frame, the boiler is tested under hydraulic pressure; it is then attached to the frame and lowered over its wheels by means of two overhead cranes. The men do not wait for it to be lowered before getting to work on the finishing touches of the boiler itself. Several are found at the fire box end, and perhaps one at the front.

With the boiler and frame settled on the wheels, and the pedestal binders and spring connections in place, the setting of the valves is the principal job to be done. This is accomplished by tramming, with the driving wheels mounted on rollers that raise them from the track. One of the rollers is turned by a small electric motor with a heavy gear reduction, the valves being set quickly. The average time does not exceed two hours. Finally, before being sent to the round house for return to service, the locomotive is given a trial run on the tracks adjoining the yard; all this within five days after the locomotive entered the shops at Omiya.

In the Forthcoming Number——

Following his participation in the World Engineering Congress at Tokyo, Fred H. Colvin spent several weeks in the more important shops of Japan, and the present article is a direct and enlightening result.

In the forthcoming number, we shall present another article from his pen, on the subject of Selling Machinery in Japan.

Completed locomotive ready for trial run

EXECUTIVE · FORUM

Is Budgetary Control a Cure-all?

HIS scratch-pad was a jumble of curlicues and figures. Try as he might, Watson Marshall could not reconcile the audit figures with the budget figures he had set down so hopefully a year before. Bad enough to have the auditors prying into every nook and cranny of the Versatile Iron Works, questioning and checking and verifying, without having them dig up a devil's brood of disappointments. Auditors would try the patience of the patron saint of all corporation presidents. Why, man, we've had the biggest year's business in our history, and here we are just one jump out of the red. He ran his fingers through his hair.

"Bill," he said to his friend and industrial counsellor, William Holland, "haven't you something in your bag of tricks that you can give me? Surely you've bumped into this same kind of situation somewhere before."

"Certainly I have. I've been trying to give it to you for ten years at least. Every year you tell me that your business is different, and go only part of the way. Since you've been showing good black figures year in and year out, I've sometimes thought your business *is* different. I don't want to rub it in but it looks now as if it may not be so different. What you need is budgetary control."

"Budgetary control!" said Marshall, "I've budgeted until I'm dizzy."

"Don't deny it a bit. I'm sure you've budgeted faithfully, but I'm equally sure that you've never really utilized budgetary control. What good does it do you to set down figures when all you do is to make an annual speech about them, and file them away for comparison a year later. I know you don't exactly do that, but you permit this account and that account to get out of hand; Brady needs extra money for the shop, MacDougal needs extra money for the sales department. You've been trying to run your business on 'historical figures' alone when you really need, and need to be governed by, sound 'forecast figures.' Let me read you what this N.A.C.A. Bulletin (Vol. XI, No. 5) says about budgetary control. Better still you read it."

A. It gives the maximum assurance of the desired profitable sales, production, and financial program.

B. It enables costs to be used for current control rather than for mere history.

C. It minimizes uneconomical uses of capital, such as:
   1. Undue expansion of plant to meet temporary sales demand,
   2. Inventories out of balance with sales and production requirements,
   3. Unwarranted investment in work-in process because of lack of proper production control,
   4. Unrecompensed financing of customers through excessive datings or excessive storage,
   5. Irregular use of plant assets on account of uneven sales demand.

D. It reduces waste through:
   1. Study of costs and expenses before actual costs and expenses occur,
   2. Institution of wage payments based on results,
   3. Assignments of responsibility for expenditures,
   4. Standardization of machinery and processes.

E. It indicates the importance of a sound plan of organization.

F. It provides a measuring stick for actual performance; no executive is beyond the good influence of materializing his plans for the coming period, and then checking the results of yesterday's decision with today's evidence of profitable results.

What Do You Think About This Executive Problem?

In this present day of kaleidoscopic business changes, what are your opinions concerning budgets and budgetary control? Your experiences? Are there better plans for control?

The whole world seems to be whirling faster, and in America, at least, business leaders must give genuine thought to maintaining their business leadership. *American Machinist* will welcome your own best thought on this executive problem for publication and discussion, and will pay for it.

Topic and material furnished by
Thomas B. Frank, Treasurer,
The Cincinnati Planer Co.

DISCUSSION

OF PREVIOUS PROBLEMS

Making a Manager Out of a Foreman

Some executives have seized upon the idea that by apportioning a certain amount of money to a department, based on a guess that it should be lower, some mysterious power will suddenly endow the foreman with the ability necessary to analyze his problems and effect saving in production and expense.

From my experience, I find that such executives know little or nothing about the principles of organization; such gestures as these are usually nothing more nor less than silent confessions of their own inability to read the compass of their business and to steer the course accordingly.

If a plant is poorly organized, and lacks systematic control, it is not practical to burden the foreman with the additional responsibility of worrying over the finances of his department. Furthermore, in such a plant when the foreman usually has to function as a timekeeper, tool designer, inspector, planner, employment agent, etc., it is doubtful if a fair basis could be determined for a bonus.

Bonus should be paid when it is the result of greater efficiency based upon an accurate knowledge of what might be termed 100 per cent performance in each instance. If bonus is paid on a guess, it results in the foreman's either making bonus too easily, in which case he does not exert himself and the company loses money, or if the standard is set too low, he becomes disgusted, makes no effort at all, and the company again loses money.

If a plant is organized and controlled systematically, so that the quality and quantity of labor and material entering into the product are measured, and standards of performance established, it would be practical to offer a bonus to the foreman for reduction in cost of operation. Under these circumstances it is a decided advantage, and the foreman will respond because he knows that expectations are based upon analysis and not guesswork.

A bonus should consider all the various factors that enter into costs, such as percentage of factory activity, departmental average percentage of efficiency, operators' base rates, percentage of scrap, percentage of day work compared to bonus hours, and department expense compared to productive hours. All of these factors should be embodied in a foreman's elemental bonus chart, this chart being laid out to increase or decrease the bonus in proportion to the relative value of each element.

Under this plan a foreman is aware of the weak spot in his department, and as it affects his pocket, he is not likely to upset everything else to make a showing, as would be the case if the bonus only effected one element of the expense.

—WILLIAM E. HAMILTON, *Industrial Engineer, Evanston, Illinois.*

Upsetting Production Schedules

Every well-regulated production shop has a recognized scheme of scheduling work. For a major executive to rush in special work on the strength of the prestige of his position, entirely disregarding the established system and expecting to get the additional work done without interruption of current schedules, is to betray a fundamental lack of knowledge of organization. It's done, of course, but usually by canny production managers who know the executive's weakness and who leave enough slack in the production schedule to absorb the extra work. So, while the unknowing executive may feel gratified by the results so obtained, the wise executive sees the fallacy of such organization, and realizes that the best production manager is the one who is always planning the maximum output per man-hour at all times, and who cannot slip in extra work without other delays.

This is particularly true when the extra work is new and in the development stage. Not only are there many problems to be solved between experimentation and production, but the production manager is entitled to a clear advance analysis and a responsible estimate of the volume of such special work to be undertaken. How can the production man tool up properly and economically, if the only advance basis he has is the direct individual and unco-ordinated order of his major executive? Too often, it has been the sad experience of a production manager that executive enthusiasm soon cools. What was regarded as a big thing quickly dwindles into nothingness, and he is left with interrupted production orders and unusable equipment. The president who unnecessarily ignores the system, and yet holds others responsible for the effect of his acts, is just piling up trouble for himself.

—BERNARD F. MCCORMACK.

The Night Shift

As a general thing, the tasks of the night crew have been laid out by those who supervise the day work, servicing operations have been arranged for by the day shift, and in various other ways the responsibility, aside from mere processing, has been removed from the night crew. It is therefore a question whether the hours of the night shift should be shortened. As a matter of fact, where only two shifts are employed, the common practice is to make the schedule of the night crew a couple of hours longer than that of the day crew.

In the original presentation of the topic, the proposal was made that the night crew should work fewer hours and receive extra pay. However, if the company is operating under a normal ratio between direct expense and overhead, the payment of 50 per cent more wages per hour to each man on the night shift will probably offset the saving obtained. To curtail the hours, except to the extent of reducing the number of nights worked per week, will mean that all night super-

visors on a salary basis will cost the company an amount that will still further pare down the margin of profit.

The question was raised whether the day crew might not become discontented, because the night men were receiving 50 per cent more per hour. The normal day crew is made up of older employees who would not care to work nights under any terms. Instinctively they feel that their daytime job offers them a perquisite that more than offsets any increase in rates received by the night crew.

—D. C. WRIGHT, *Industrial Engineer.*

Friendliness in Business

Unfortunately, too many industrial leaders see their business affairs from Mr. Armstrong's point of view. They do so, though numerous examples demonstrate that friendliness is the mightiest help in all human affairs. In my experience I have found that, though they know better, buyers employ the old-fashioned business method represented by Mr. Armstrong. Of course Mr. Armstrong "obtains" a price-allowance, but I think such business methods are only wastes of time in the long run. I have found, that our factory had the advantage when the seller was told kindly that we are not willing to "fight" for price, and that he should make only one price to us. If we would find afterwards that his price was not a fair one, he would get no more business.

Buying transactions based on friendliness educate and oblige the vendor to play fairly, so that he will become our helper. Of course, friendliness means not that we should fail to examine a given proposition.

A so-called strong man like Mr. Armstrong is no good director; his chronic unfriendliness is even a danger for the company, because he surely misses many an occasion to make valuable connections for the future. Finally, I cannot help saying it, it seems to me that the unfriendliness of so-called strong men often serves to hide personal unfitness.

—FRANZ BERMANN, *Supt. Locomotive Factory, Austrian Hungarian Licensed Railway Vienna.*

Upsetting Production Schedules

The shop showing the greatest production possible is the one that is controlled by a level-headed manager. He works to a plan or schedule as a general thing, but when really necessary to meet a promise, he breaks in where the least trouble and delay will result.

One of the annoying things that demoralizes a shop gang is the "breaking up" of a run on a given machine. The operators feel that they lose money, the setup men have an extra setup to make, and the foreman's production record suffers.

This case recently came to my attention. The foreman had received orders to break up on several smooth-running jobs at the same time. I met him in another department with a worried look on his face. When questioned in a good-natured way, he admitted he was taking a walk to steady his nerve and let the storm among the men blow over. These break-up orders may have been necessary from one point of view, but if the cost could be computed and known in advance, the chances are that the number would have been much less.

Such incidents are very common in shops where the sales department is allowed to make offhand promises. They usually cause friction between the shop and the salesmen, add to the cost, and many times make dissatisfied customers.

—L. F. SWENSON, *Industrial Engineer, Perkins Machine & Gear Company.*

Equipment Replacement In Slack Periods

It should be clear that, because of changing conditions, a financial policy which is apparently safe at one time may be most unwise of even suicidal under other circumstances. It is evident that not all industries are affected in the same way at the same time by fluctuations in general business conditions. Much will depend upon the nature of their costs and the chacracter of their markets. It is therefore almost impossible to decide on an equipment replacement program for two different types of business in a similar manner.

There is every indication that we are passing through a period of depression. However, the period of depression should not be severe. It is characteristic of a certain phase of the so-called "business cycle," a term scarcely known to the business man until after the end of the World war, when the economist began to popularize its use.

The wise company that is planning to expand its business by equipment replacement is riding on the crest of a wave that will ultimately lead to increased profits. As an example of the working of the business cycle—during the period of depression of 1920-21, the low point in production was generally reached in July, 1921, while a year later many of the leading industries were operating close to 100 per cent of normal production.

Replacements made in slack periods will tend to stabilize production and will have a favorable effect on the welfare of any community. Also, in the period of increased production which inevitably follows a period of depression, the company having the equipment will have the advantage of being able to carry out production schedules and will not have lost the benefit of quick deliveries on new equipment. It will have been able to do construction work when the plant was not running at capacity.

Having machines ready and in good shape is insuring profit in the days to come when the rush to meet production schedules returns.

—HARRY KAUFMAN, *Public Accountant.*

Semi-Portable Conveyors in Tractor Production

By CHESTER B. LORD
Associate Editor, American Machinist

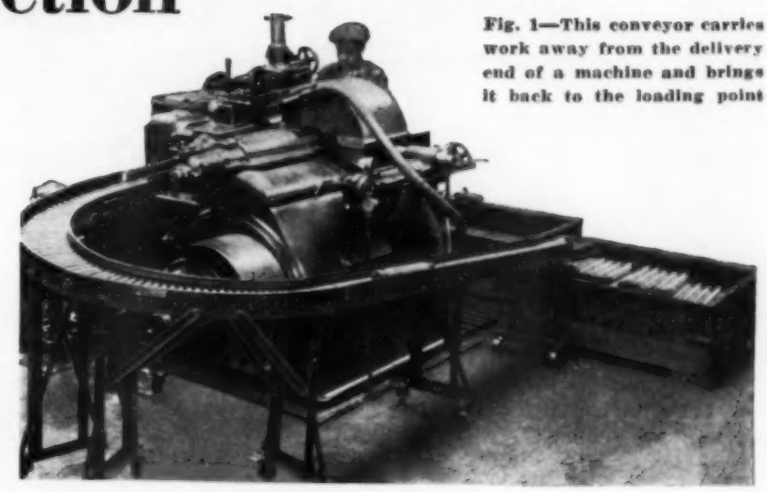


Fig. 1—This conveyor carries work away from the delivery end of a machine and brings it back to the loading point

Short roller conveyors of the gravity type keep materials steadily on the move from one operation to another

SHORT, gravity, roller conveyors are used throughout the different departments of the San Leandro, Calif., plant of the Caterpillar Tractor Company to aid in the movement of work from one operation to another. In many cases they are portable, which permits rearrangement and facilitates the cleaning of the floor.

A rather unusual section of portable roller-conveyor is shown in Fig. 1. It is suited for work requiring centerless grinding. Parts requiring this form of finish undergo from two to nine operations, or passes, and the provision of a means of returning them to the loading position after each operation has aided considerably in simplifying an awkward transportation problem. For example, the wristpins being ground in the set-up shown require seven roughing and two finishing passes that remove approximately 0.017 in. of metal and finish the diameter to 1.75 in. The work is run through in lots of from 500 to 600 at a speed of 400 per hour for roughing and 600 per hour for finishing. As soon as the work has passed through the machine, it falls on the roller conveyor and is brought back to the loading position. A stock box at the delivery end of the conveyor catches the wristpins as they are returned. The illustration shows that the delivery end of the conveyor has been blocked. The final operation is being completed, and the finished work will be picked up from the conveyor and placed in the box of a platform truck. The same conveyor arrangement is used for track-roller shafts, pistons, valve tappets, and other work to be ground in a centerless grinder.

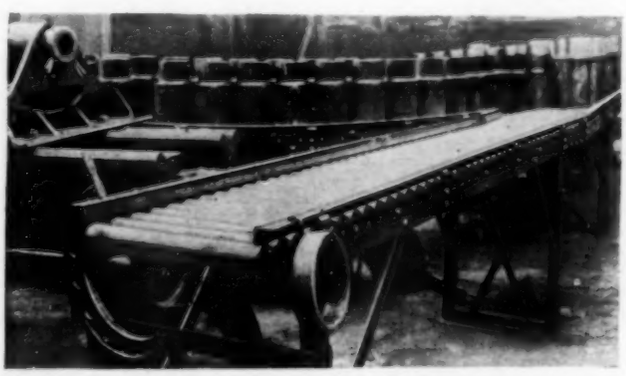


Fig. 2—Cylinders are inspected between operators, on the end of the conveyor

Another form of short-length gravity conveyor is illustrated in Figs. 2 and 3. This unit is in use in the cylinder department where it conveys the work from one operation to the next. Conveyor sections of this type are used when the products of two or more machines are to be passed to a single machine. In this particular example, the conveyor is used to carry two types of cylinders from two separate machines to a single machine that will perform the next operation on both. These conveyor lengths are not mounted on casters. Being of a semi-permanent nature, they do not require rearrangement to accommodate cylinders for the different models.

One of the important units of tractors is the link, an alloy-steel forging made in several sizes. The operations in its manufacture include drilling, reaming, milling, and boring. In making the links, the machinery is so placed that the various operations follow one another in a straight line. The arrangement of the machinery is flexible enough to suit the manufacture of the various models of links, but, in some cases, the set-up for links for tractors of one model may prevent the use of certain machines that are required on other models. For this reason, it is often necessary to rearrange the movement of materials slightly. Portable conveying units facilitate these changes. Before the links are brought into the machine shop, they are loaded on lift-type skids. The first machining operation on the links is shown in Fig. 4. It consists of boring and reaming the pin holes. The rough forgings are located at the right of the machine, and, after they have been machined, they are placed on the roller conveyor and carried to an accessible position for

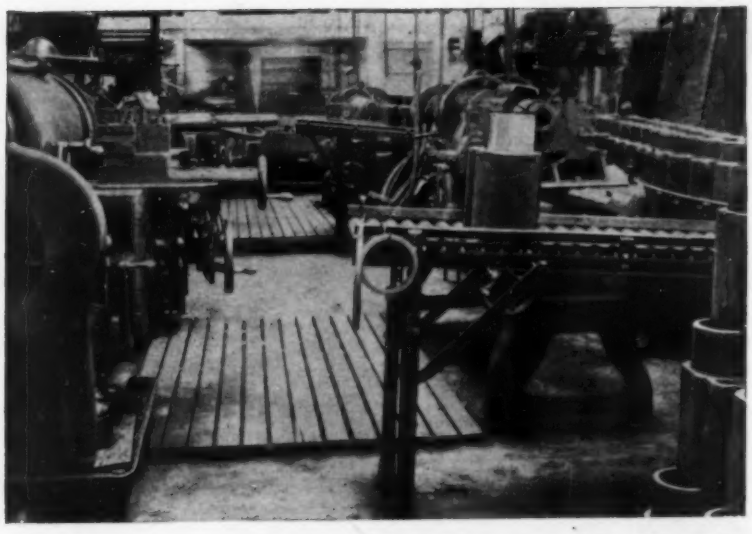


Fig. 3—Another form of short-length, gravity conveyor. This unit is in the cylinder department and is used to convey cylinders of different types from two machines to one machine where the same operation is to be performed on both types

Fig. 4—After boring and reaming the pin holes in them, tractor links are dropped on to a short, gravity conveyor and are carried to a position convenient for the next operation

the next operation. The conveyor unit is supported on two legs equipped with casters. It is slightly inclined for operation by gravity.

Another view of the link department, showing a group of machines interconnected by short lengths of roller conveyors, is illustrated in Fig. 6. The equipment used for the final operation on the link is shown in Fig. 5. The gravity conveyors are slightly taller than are those in use in other sections of the department, their height being commensurate with that of the machines they serve. The finished work drops from the delivery end of the conveyor into boxes built on lift-type skids.

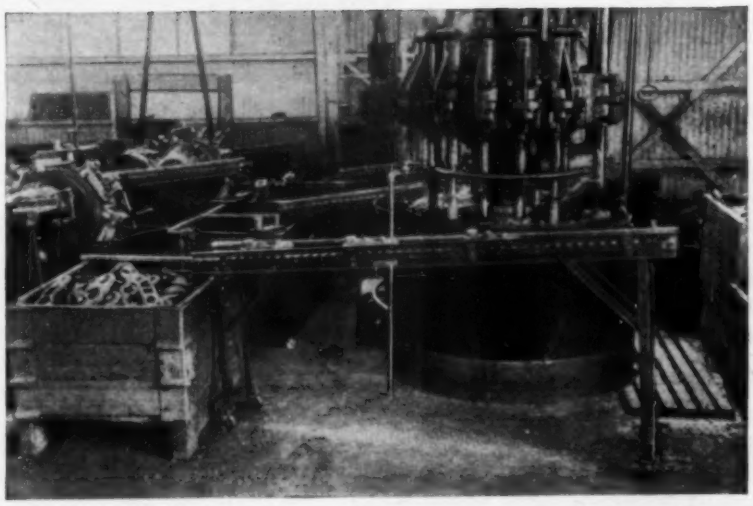


Fig. 5—Equipment for the final machining operations on the links. The gravity conveyors are somewhat taller than are those used in other sections of the department, the height being suited to the machines

At the present time, manufacturing plants are devoting considerable thought not only to the reduction of costs in materials handling, but also to the reduction of inventory. Conveying equipment suited to one type of manufacture may not be satisfactory for another; therefore, an individual study of the existing conditions is necessary in choosing the proper type of conveying apparatus to suit the special conditions existing in any plant. The equipment described has helped to keep the flow of materials constant, although it has been found necessary to provide a certain amount of flexibility between operations because of the difference in their natures. Before these conveyors were installed, the handling of work through the shop was difficult because of delays resulting from congestion. An adequate means of moving parts has resulted in a more uniform daily output.

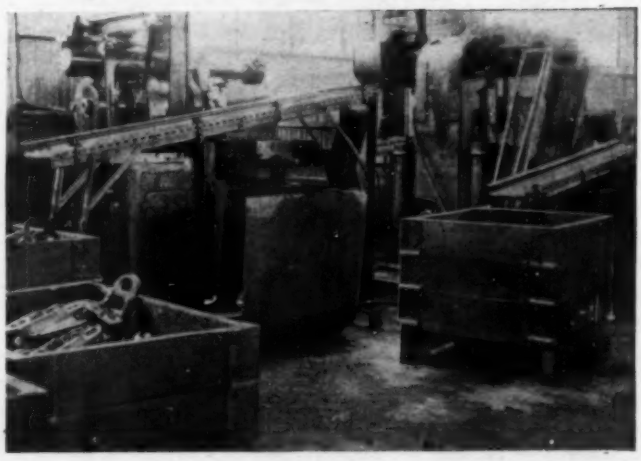


Fig. 6—A group of machines in the link department interconnected by short lengths of gravity roller-conveyors

A Safety Campaign That Achieved Results

By Edwin W. Thomas
Assistant Superintendent, Standard Steel Works Company

PRIOR to 1924, the accident rate of the Standard Steel Works Company had been drifting along at a pace no better and probably no worse than the average prevailing in similar industries. That year marked the turning point. In December, 1923, the works manager, in his annual address outlined accident prevention as the major activity upon which he wished the organization to concentrate its efforts during the coming year. He branded as false the notion, then generally prevailing, that accidents are necessary in industry and are a part of the price that has to be paid. Accidents were to be attacked from the point of view that thew were practically always preventable.

Table I—Accident Record at the Standard Steel Works

	1924	1925	1926	1927	1928
Average No. Employees	1,938	2,167	2,366	2,046	1,911
No. Man-Hours Worked	4,407,616	5,596,654	6,271,627	4,529,684	4,095,615
Deaths	0	1	0	1	0
Permanent Disability	3	5	3	5	1
Temporary Disability	163	48	12	6	2
Total Accidents	166	54	15	12	3
Days Lost	4,972	8,708	5,437	11,438	3,095
Frequency Rate[1]	37.61	9.47	2.391	2.649	0.732
Severity Rate[2]	1.12	1.56	0.87	2.525	0.754
Total Cost	$40,665	$27,464	$19,045	$19,410	$17,107
Compensation Payroll	$13,889	$874	$874	$4,320	$2,267

[1] Number of lost-time accidents per 1,000,000 man-hours worked.
[2] Number of days lost per 1,000 man-hours worked.

There was in existence a safety organization which had functioned in a routine manner since about 1914, but it required several months early in 1924 for the full significance of the program laid down by the works manager to become thoroughly saturated into the minds of the operating personnel. In May of that year the preliminary work of the preceding months took on definite form, and a complete re-organization of the safety committees and safety activities was effected. An executive committee was formed, headed by the works manager and consisting of two of his immediate assistants plus a central safety committee made up of department superintendents. These department heads in turn organized committees in their respective departments.

The campaign for accident prevention was promoted in many different forms during the following years, the main objective being to educate every employee to the importance of preventing bodily injury to himself and fellow workmen. Every means was employed to keep the subject before everyone at all times. Committees were elected, in some instances by popular vote, and considerable rivalry was stirred up in these elections. In other instances, committees were appointed by department superintendents. These committees met regularly, and their work was very effective. All accidents were investigated, suggestions for the prevention thereof discussed, and many of those injured were brought before the committee for questioning. Thousands of suggestions were offered for physical changes to lessen the possibility of accidents, and many were found practical and adopted.

Two series of posters designed within our own organization were placed on attractively lighted bulletin boards. Many slogans were suggested by our workmen, contests having been conducted and prizes offered for

Table II—Analysis of Accident and Welfare Costs

	Hospital	Doctor's Fees	First Aid	Glasses Etc.	Compensation Pay-Roll	Funerals	Compensation Reserve Fund	Pamphlets Safety Council	Totals	Due Future
1921	$3,138.35	$541.50	$215.76	$42.70	$5,639.90	$0.00	$12,449.42	.....	$22,216.77	.....
1922	10,639.10*	259.00	421.54	70.00	8,735.26	300.12	9,413.36	.....	29,981.09	.....
1923	24,976.00*	753.50	793.16	60.25	21,008.72	825.00	8,094.77	.....	56,860.08	$50,230.17
1924	8,703.52	8,780.30	320.02	263.35	13,889.44	150.00	8,456.25	.....	40,665.33	41,641.24
1925	4,844.45	6,617.50	584.47	154.50	873.60	300.00	13,127.63	.....	27,464.26	20,692.08
1926	3,282.90	5,061.00	409.75	540.37	873.60	400.00	7,580.30	.....	19,045.39	16,683.29
1927	3,065.03	4,748.60	619.47	571.00	4,320.33	450.00	4,863.61	.....	19,409.60	17,983.22
1928	2,621.04	3,789.50	429.38	531.00	2,267.79	0.00	7,138.20	$329.66	17,106.57	14,833.98

*Includes doctor fees.

the safety slogans. Many general safety meetings were held which were first addressed by the works officials and later by some of the workmen themselves. It was not uncommon to stop an entire shop employing as many as 400 men and assemble them for a fifteen-minute talk on safety. Many safety picnics were organized by shop departments to which workmen and their families were invited. At other times prizes were offered to school children for essays on safety. All of these activities were designed with the thought in mind of having accident prevention become automatic in daily actions.

It was felt that while posters, essays, bulletins of various kinds, picnics, etc., contributed to the final results, the greatest factor in bringing about the very excellent results was the personal contact. The workmen were, of course, rather skeptical at first, especially when the management took such an active part, devoting so much of its time to the general education of the workmen in accident prevention, but after a short time this feeling was broken down. Certainly no factor has contributed more to a harmonious relationship between men and management than was brought about by this safety movement.

Of course, the workmen were constantly reminded of the material advantages of preventing bodily injury to themselves, because, after all, it is the workman and his family that are the greatest sufferers when an accident occurs, regardless of the compensation paid. But while these safety efforts were promoted from the standpoint of humanity rather than from the monetary side, the savings from the campaign were not overlooked.

Several exceptional records of individual departments were made that are worthy of special mention. For example, in the tire mill, where about 125 men are employed, at the time of writing, there had been no lost-time accidents for a period of four years, three months. The wheel rolling mill, with approximately 100 employees, has a record of three years, eight months without a lost-time accident. These are great achievements, considering the hazards of the two departments. For the plant as a whole, a record of 252 days without a lost-time accident was made in 1928, from January 25th to October 3rd. The best previous record was 167 days.

Table III—Comparison of the 1928 Accident Experience of Sixteen Firms Engaged in the Metal Industry in Pennsylvania

Case	Average No. of Wage Earners	Fatal Accidents	Non-Fatal Accidents	Fatal Rate per 1000 Employees	Non-Fatal Rate per 1000 Employees	No. of Eyes Lost
A.....	1,704	..	74	0.00	43.43	..
B.....	299	..	30	0.00	100.33	..
C.....	499	1	27	2.00	54.11	..
D.....	4,602	2	56	0.43	12.17	1
E.....	26,682	18	439	0.67	16.45	8
F.....	26,347	23	391	0.87	14.84	2
G.....	2,564	2	207	0.78	80.73	..
H.....	7,597	1	143	0.13	18.82	2
I.....	749	..	28	0.00	37.38	..
J.....	457	..	20	0.00	43.76	..
K.....	3,078	1	38	0.32	12.35	1
L.....	3,017	2	161	0.66	53.36	..
S.S.W...	1,869	..	4	0.00	2.14	..
M.....	104	..	9	0.00	86.54	..
N.....	4,089	1	256	0.24	57.72	2
O.....	22,239	5	364	0.22	16.37	2

· BOOK · REVIEWS ·

MODERN AVIATION ENGINES. *By Major Victor W. Pagé. In two volumes containing respectively nine hundred seventy-six and nine hundred thirty-two pages, 6x9 in. Cloth board covers. Published by the Norman W. Henley Publishing Company, 2 West 45th Street, New York, N. Y. Price $9 for the two volumes.*

THESE volumes, written primarily for the instruction of students intending to become aviators or aviation mechanics, are quite similar in general arrangement and purpose to other automotive books by the same author. Emphasis is placed upon operation and repair, with much of the material drawn from engine manufacturer's catalog and repair manual sources. Only such elementary theory as is considered necessary for general readers is included.

While many of the engines described are obsolete types, as is natural in so comprehensive a treatment of an art which has been developing rapidly, there are also data on recent types. Some of the drawings doubtless will prove useful to designers, at least for reference purposes, but the text is too elementary in character to satisfy engineers who have more than a general interest in aircraft engine design.

Much of the data on material used in engine construction is taken bodily from the S.A.E. Standards Handbook. To this the author adds rather superficial statements on the materials listed and the use of the data.

Considered as a whole, these books contain information of value to the student aviator and the mechanic, but they leave ample room for improvement in arrangement and manner of presentation. For textbook purposes a large part of the historical matter well might have been eliminated and the remaining subject matter condensed into a single volume.

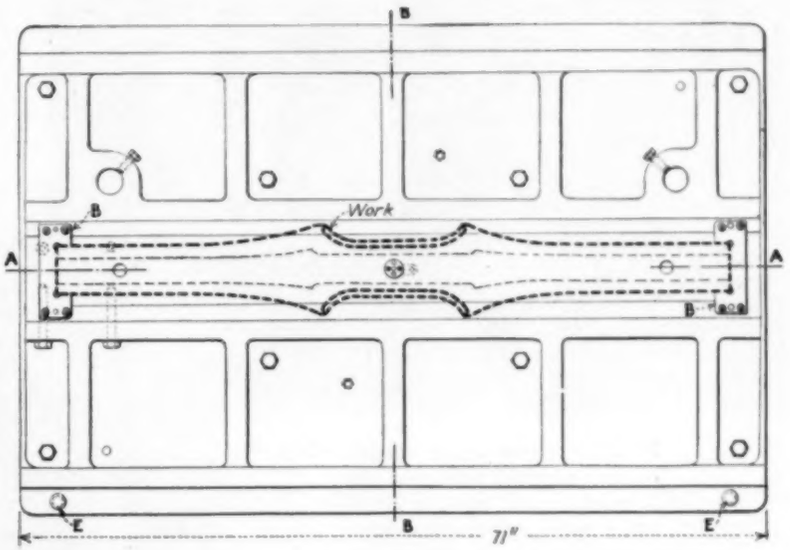
*

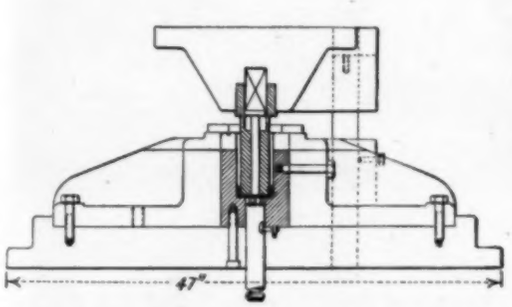
PROGRESS TOWARDS LEGAL RECOGNITION OF A PRECISE INCH STANDARD.—American Institute of Weights and Measures, 33 Rector Street, New York, N. Y. This is a paper delivered by William E. Bullock at the annual meeting of the Institute on December 3, 1929, outlining the present status and the contemplated steps towards legal recognition of the precise inch standard, and the effect of the difficulty of incommensurate metric standards. The paper explains the difficulty in settling upon a definite value for the inch in relation to the wave-length of light, because of the inability of countries using the metric system to agree upon a definite wave-length value for the meter. So long as the meter is not standardized, the author of the paper can see no means of internationally standardizing the inch. He further advocates, since the English system of measurements belongs fundamentally to Great Britain, that the British National Physical Laboratory in London take the lead in the setting of the inch standard and the precise ratio between the inch and the meter. This paper is of interest to all manufacturers interested in precise measurements and their present situation. It can be obtained from the Institute, and discussion is invited.

Dies and Tools for Four-Piece Rear-Axle Housings

By Frank W. Curtis

AFTER the half sections of rear-axle housings, as made by the Chrysler Corporation, Detroit, have been folded at the banjo face, they are ready for drawing. Because of the thickness of the metal it is necessary to do the forming in two operations, the first of which draws the blank to the approximate shape, and the second restrikes the drawn piece to the desired dimensions. Constructional details of the drawing die are shown in Fig. 8. The blank is placed in the die as outlined, being located by the two nest plates *B*. The working section of the die is made of fourteen





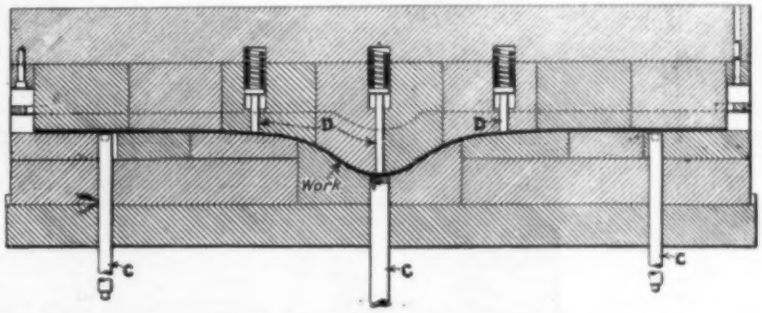


Fig. 8—On account of the thickness of the metal it is necessary to draw the housings in two operations. In the first die, the blank is located by two nest plates that centralize the blank uniformly

pieces of hardened tool steel, and that of the punch is built of seven pieces. The sections constituting the die are inserted in a die shoe that, in turn, is attached to a stiffening plate. Those of the punch, or upper half, are mounted directly on a cast-steel punch plate. A cross-section view of the construction is shown at the lower left of the illustration, this being taken through the center of the die.

Ejection of the formed work from the lower die, in which section it is most likely to stick, is by means of three pins *C*. These pins are connected to a spring pad mounted under the press. In the event the work should stick to the punch section, it is stripped by the three spring pins *D*. The hardened dowel pins *E* at the front edge of the die shoe prevent movement of the die, while the punch and die are held in alignment by two guide pins.

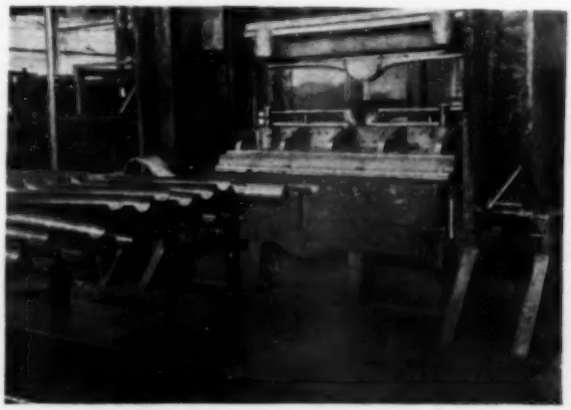


Fig. 9—After the first draw, the housings are swaged to shape. The work is located by two end plates and rests on three ejecting pins

The press used for redrawing the axle halves to size, shown in Fig. 9, is located close to the press that does the first operation. The die is similar in construction to the one described in the previous illustration, and uses a guide-pin assembly made up from the same patterns. The work is located from side gages and is placed in the die to rest on the ejecting pins as shown. At the left is the rack used in transporting the finished halves to the next operation. A similar type of work holder is positioned at the other side of the press, so that the two

The second and concluding part.

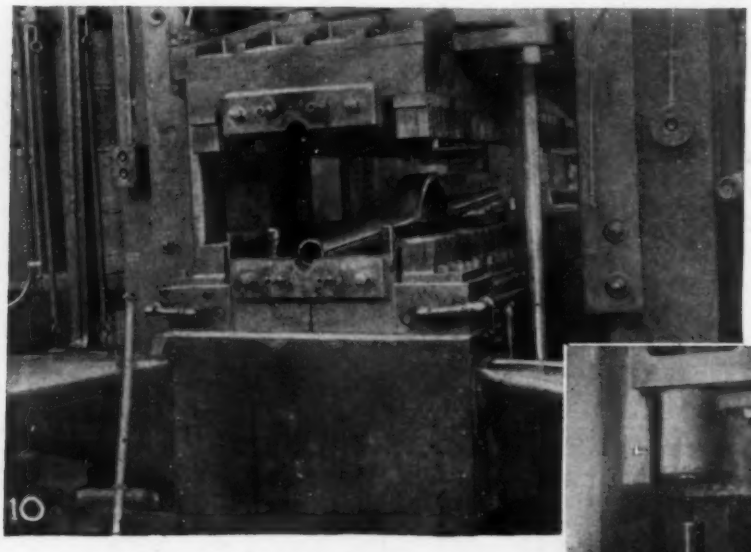


Fig. 10—Two half sections of housings are welded together in this machine. The low-voltage circuit is completed by a series of copper contacts located on each side of the die section

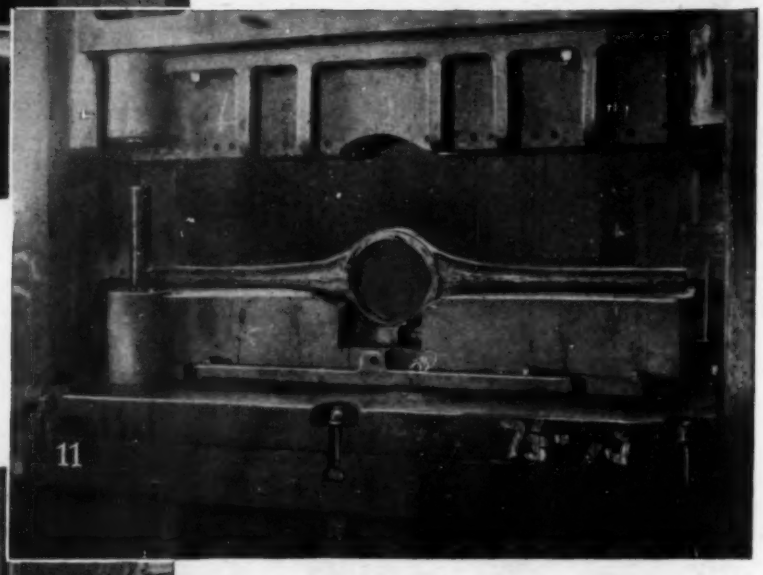


Fig. 11—After being cooled on an overhead conveyor the housings pass to the trimming press, where the flash along the edges, caused by the welding operation, is removed

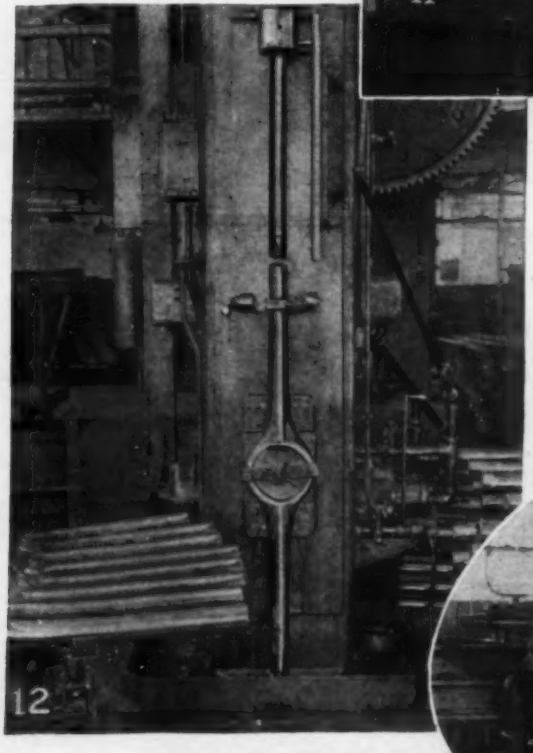


Fig. 12—The broach is mounted on a rotary head so that after the downward stroke has been completed the broach can be revolved about 90 deg. in order that it will not drag on the welded edge when withdrawn

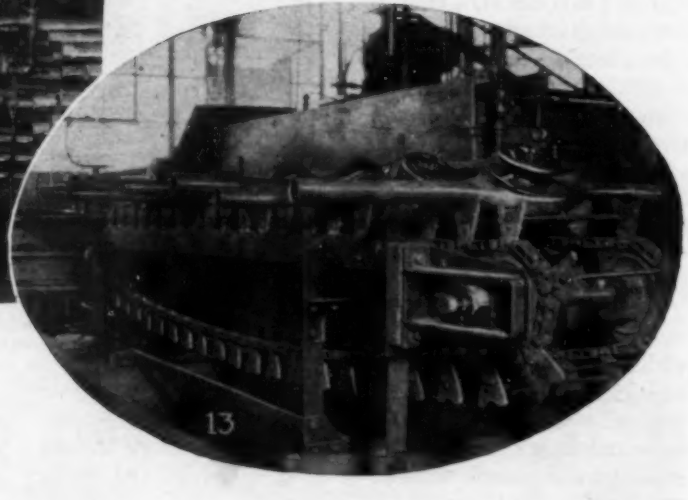


Fig. 13—The flanges of the housing are upset in two operations. After the completion of the first operation, the work is placed on a conveyor and transported to the second flanging machine

operators, one on each side, do not have to carry the work very far.

Next in the sequence of operation, comes the joining of the two halves, which is done in the welder illustrated in Fig. 10. It is, in effect, a press, since the main units are a stationary die and a vertically-operated die attached to the ram. An operator and a helper, one stationed at each side of the machine, handle the operation. A row of knife blade contacts along each side, as shown, form the electrical connection when the dies are closed. In operation, the upper die is brought part way down until the current jumps the gap between the two halves of the housing, and fuses the metal; the dies then close, finish the weld, and at the same time, hold the housing to its finished form and size. Because of the heat generated during the welding operation, it is impractical to perform the next operation immediately. Therefore, the welded housings are placed on an overhead conveyor to travel a distance of approximately 40 ft. and return, in order that they may cool sufficiently, for handling. At one point in the return line, the housings pass the press shown in Fig. 11, where the flash on the outer surface of the welded seam is trimmed. The upper and lower die sections are made of cast steel with hardened tool-steel cutting edges.

Fig. 14—Because of the end pressure exerted during forging, it is necessary to place expanding plugs in the center opening of the housings so that they will not go out of shape

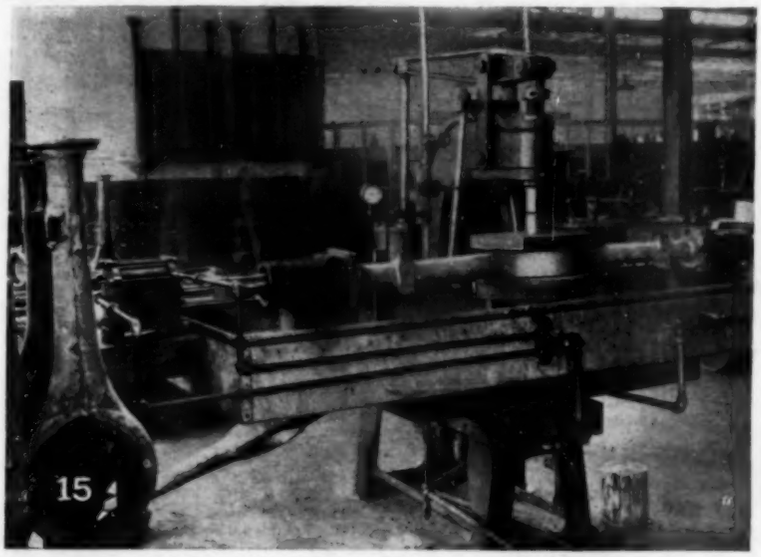


Fig. 15—Housings are given a water test after being located in this machine, which seals all the open portions. The seals are made by rubber cushions operated by three air cylinders

The inside flash is trimmed by the hydraulically-operated broach shown in Fig. 12. The axle housing is held vertical over a locating stud in the floor and is aligned at the upper end by a centering clamp. The broach, held in a rotary head, removes the flash on the downward stroke. On the return stroke the broach is turned about 90 degrees by a cam device, so that as the broach is withdrawn it will not drag on the welded edges. After the completion of one end the work is turned for the removal of the flash on the opposite end. The outside flash is then rough ground on an abrasive wheel, and in this condition the housing is ready to be upset at the ends. For the upsetting operation, two bulldozers are used, each of which has a continuous-type furnace located close by to heat the ends. The furnace end of one of the two units is shown in Fig. 13. The housings are first fitted with an expanding plug in the central opening to take the thrust of upsetting and forging. It also prevents the part from acting as a flue for cold air. The housings are then placed on the conveyor, so that one end passes through the heating chamber of the furnace. After the housing has been heated to 2,350 deg. F. the end of the housing is upset to provide sufficient metal to form the flange. The work is then transferred to another conveyor where the opposite end is heated preparatory to being upset. One of the forging units, which shows the bulldozer more clearly, is shown in Fig. 14. The flange is formed in a three-stage die. A housing, ready to be removed from the die, may be seen at the lower portion of the machine at *A*. The finished end of the housing is backed up by thrust pins, as shown at *A*, which support the work during the forging blows. The expanding plug in the central opening lessens the possibility of having that part of the housing distorted by end thrust. The completed housings are placed on the conveyor shown on the right, which transfers them to the next operation, that of welding the spring pads in place.

The housings are tested with hydraulic pressure in the unit illustrated in Fig. 15. The work is loaded in the machine, so that one of the banjo faces rests on a rubber cushion, the ends projecting as shown, and then another rubber pad, on the air-operated ram above, is lowered against the opposite face, thus forming a seal.

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions given at the foot of the page have been prepared

Off With the Old, On With the New

"WELL, Al, I told you it would be a good idea to buy those automatics, but you and Williams laughed at me, didn't you?"

"Yes, and I still laugh occasionally at the things I hear about them."

"Is that so? Well, you won't laugh any more for a while then."

"How come? Had some luck?"

"I'll say. A kind of odd-looking guy came into the department this morning and said he heard we had some new automatics, and could he look at them? You know, Al, something told me that maybe he knew automatics."

"Maybe it was your intellect, old scout."

"Never mind the wisecracks now. Make them when I get through. Well, as I was saying when you interrupted me, I got the impression that he knew automatics, and as I wanted to learn something more about them myself, I let him talk."

"And was the operation successful?"

"Is that another wisecrack? Well, anyway, I learned more in a few minutes than I thought I knew before."

"How did he get past the gate and the employment office?"

"I asked him that, and he said he wasn't looking for an employment office until he saw what the job was like."

"Did you hire him?"

"Did I? I busted every rule we ever made about employing men. I wouldn't even let him go back to the employment office. I was afraid to ask him what rate he wanted, but he asked me. I hemmed and hawed and finally told him the highest one, breaking another rule. But he told me that was more than he had been getting, and gosh, how relieved I felt."

"You fell hard, didn't you? Can he make good, do you think?"

"Can he! Say, he pointed out how he can double-cam those machines on simple jobs, how he can make two or three different pieces at the same time, where the lots are not big, and he don't want a set-up man around."

"Too good to be true, Ed. No one would let a man like that get away. I'll bet a sheriff will be along soon looking that chap up for back alimony."

"Nix! He quit because he was tired of fighting a bunch of antiquated war widows. He said he knew every bad point about them but seldom had an opportunity to try out new kinks."

"That was doing pretty good for a hard boiled skeptic like you. Maybe you have really struck some luck, even if it does sound a little fishy."

"Luck nothing! I was only ready. Haven't I been fighting for automatics ever since I have been here?"

"Oh, so that's what you have been fighting for, is it? I knew you had been fighting, but I never could make out what it was about. Good night, old top."

A good workman takes pride in his tools. Does this apply to machine tools? Does the appearance of the shop and equipment influence applicants? Why do many fail to report after being hired?

Idea suggested by C. P. Sherman

All foremen are urged to discuss these questions vital to their work; of course the

ROUND · TABLE

DISCUSSION OF EARLIER TOPICS

Raising the Working Efficiency

THIS question of shop education is a big one, and there remain many points to be worked out. One thing, however, is proven: theory without practice usually produces impractical people; practice without theory results in stunted mental growth. The shop instructor can, by recommending good trade magazines, and by lending the benefit of his greater experience, aid the struggling shop man considerably to become a real mechanic.

It is usually true that shop men resent the introduction of an instructor into their departments. Oddly enough, the greater the need the more resentment, based, probably, upon a feeling that such a man in the department reflects not only upon their ability, but also upon their intelligence. This is the first reaction, but a good instructor soon overcomes this, and if he is a real instructor, and not just a two-legged mass of facts, he soon becomes an indispensable aid to the foreman as well as to the men. The foreman's primary function is supervision, which in a broad sense is instruction, and when you increase the amount of instruction he can give, without increasing his burden, you have automatically increased his value to the company which employs him.

—E. R. SHIELDS, *Processor, Oakland Motor Car Company.*

*

Tempering of General Purpose Tools

HEAT-TREATING of metals is known as a science, but practiced as an art. Tools of great variety, and especially hand tools, require individual treatment. Instruments used to measure the desired results have one serious limitation: they merely indicate the degree with which actual conditions approach those desired. For example, a pyrometer may not always indicate the temperature of articles being heated, but rather the temperature of the furnace. After the article has been withdrawn from the furnace, its temperature falls, and it is difficult to know the temperature of the article just before it is quenched. Even if the time between removal from furnace and quenching is known, so that some estimate of the fall in temperature may be made, still, variation in the hardness of different parts of the article will occur. We may conclude that instruments are for what may be measured economically, and skill is for processes requiring empirical knowledge.

—*Ernest Simonson.*

Games at the Noon Hour

GAMES at the noon hour are beneficial because they take the men's minds off their work for the time being and thus relieve staleness and fatigue. Some engineering works in England provide fields for this purpose, committees being organized, and teams selected from the various departments. Short contests take place at the noon hour, the rest of the men being eager spectators. When the whistle blows the men return to work with renewed interest and vigor.

Evening and week-end games naturally follow, and out of a simple beginning with the noon-hour games, evolve picked teams for league matches with other workshops.

—R. G. HEWITT, *Yorkshire, England.*

*

Should the Workman Share Responsibility?

THE amount of responsibility shared by the workman depends on the foreman rather than upon the workman. The workman will usually welcome responsibility, and it is up to the foreman to know where to draw the line. In my opinion, Ed was wrong when he fired his best man for doing what he was told. The fact that Ed admits the man he fired was his best man shows that there was some misunderstanding. The man's attitude when he says, "I was paid for doing what I was told," shows either a lack of interest, or an inclination on the part of Ed to censure a man for questioning his instructions.

—W. J. OWENS, *Foreman, Newport Rolling Mills.*

*

A Bonus for the Ambitious

SEVERAL years ago I took a correspondence course in mechanical engineering, and naturally, Ed's advice to White interests me. Perhaps my own experience would not be amiss.

At the time I undertook this course I had very little knowledge of what books and other material were available on this subject as a whole. It would have been difficult to have laid out a complete course of study for myself. Thus, the correspondence course seemed best. However, even before the course was completed, I found that such information could be obtained from books and periodicals, and at a considerable saving of money. Moreover, with proper selection, such information would be much more up to date.

While there is much that is easily understood and of real value in a good correspondence course, the system used confines one closely to the text material and does not give the necessary stimulus to constructive thinking; only men who can do such thinking are of real value to industry.

In this issue of the *American Machinist* the question is asked, editorially, "Does contact with out-of-date machines in the college shop deter the purchase of new equipment in the shops to which the students go after graduation?" To this I would say yes, and in the case of the correspondence schools the same thing exists to an exaggerated degree. The same antiques are always

discussion is not limited to foremen. Letters accepted and published will be paid for

described, and the student does not have the advantage of personal contact with an instructor who, doubtless, is familiar with current practice.

In conclusion I suggest that any firm anxious to encourage any of their young men who are ambitious, supply them with a good, up-to-date, plant library. This work should be in charge of an able executive, capable of judging men and their abilities and of leading them into the work for which they are best adapted. Money thus spent may return a hundred fold, from the little things that receptive minds will glean from the use of this library. Such a plan will also save much of the money spent by men who start a correspondence course and send in only a few lessons. —GEORGE B. JENNE.

*

Games at the Noon Hour

NOON hour games are most certainly beneficial both to the health and the well being of the individual. They form a complete change for each man's thoughts. The writer has found that the petty differences and worries that essentially beset a man whose thoughts are confined to one channel, are dispelled by a happy half hour with a ball upon which he can vent his feelings.

The most marked effect of repetitious work upon humans and the root of the majority of troubles, is the suppression of that desire to show superiority which is in every heart. The rules of discipline and other forces restrain this desire of the operator during working hours, but the noon hour games will give him a chance to show, or attempt to show, how much better he can do a thing than can his neighbor. —L. R. DORIS.

*

Learning from the Small Shop

THE tool estimator should take into consideration that, although he may have a good line-up, someone else may be able to give him a cheaper and faster method of production. The shop foreman should be consulted on a special job before plans are laid for its manufacture.

The engineering department should not interfere with production methods as long as the product has the finish and accuracy called for by the drawings. I do not mean that they should not make suggestions, because, we receive many worth while ones from our engineering department.

Tool costs should be held as low as possible in relation to the total cost of the finished product. I think some of us are inclined to think of special tooling, rather than planning some way of using the equipment we already have. —RALPH N. STRYKER, *Tool Designer, Elliott Company.*

*

What You Do, or What You Get Done

THE old-time foreman, who is in charge of the department he started in and who gained his position by manual skill, is rapidly being replaced by men who recognize foremanship as a science, much as management is now being recognized. The old-time foreman was often a man who could do all of the jobs in his department better than the man who was hired to do them.

It is agreed that if such a degree of manipulative skill could be combined with the necessary executive ability, we would then have a foreman or super-efficiency, but unfortunately the foreman with the manipulative skill uses so much of his time in demonstrating it that he has no time for the broader aspects of his work such as, speeding up handling and production, improving quality, cutting down scrap, and scheduling and dispatching orders.

The average man is ready and willing to take the responsibility for his own job. In most cases putting a man on his mettle by making him responsible, will result in better work than if he is excessively supervised. —R. J. MORRISON, *Foreman, Canadian Johns-Manville Company, Ltd., Asbestos, Que.*

* * * *

THE · NEXT · TOPIC

"Mottoes in the Shop"

CORRECTION: In Summary of the Discussion, Vol. 72, No. 4, page 186, the title printed was, "When Do Automatic Machines Pay?" This should have been "Learning From the Small Shop."

What You Do, or What You Get Done

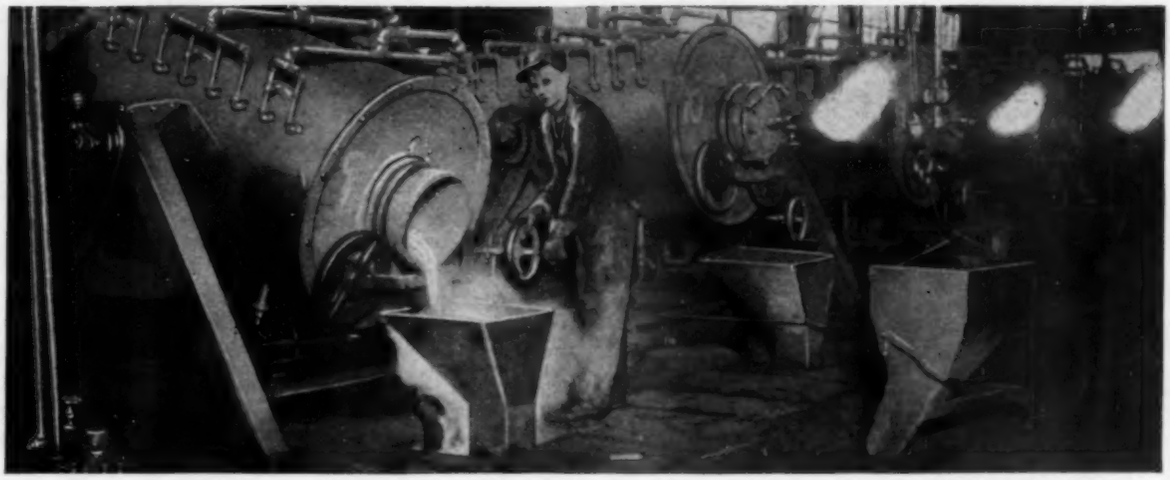
SUMMARY OF THE DISCUSSION

Ed talked too much. He went to William's office, voluntarily, to explain why a certain order would probably be late, and unconsciously, perhaps, to impress Williams with his personal interest in the matter. Williams acknowledged that Ed had worked hard, but just as Ed was all "swelled up," as Ed himself expressed it, Williams remarked that what really counts is what you get done, not what you do yourself.

COMPARATIVELY little sympathy was expressed for Ed. The opinions advanced agreed that he got "what was coming to him," and that its effect should be salutary. In fact, the criticism seemed somewhat harsher than the fault really warranted.

The abstention from manual labor on the part of a skilled supervisor is often an exhibition of will power, instead of a lack of inclination, and Ed was interested in that particular job. That he understands his duties on the whole would seem to be evidenced by his continuing to work for Williams.

Some of the older foremen who were promoted for their mechanical skill, still believe that quality is more important than prompt delivery, and find it difficult to abstain from interfering. There is some excuse for this where the work is of such a nature that it cannot be tooled up. Many curious jobs come into a contract shop, and the only solution, at times, lays not only in the foreman, but in the engineer's getting into overalls.



Photograph by courtesy of American Gas Furnace Company

Economics and Economies of Heat-Treating

By Robert M. Keeney
Connecticut Light & Power Company

SELECTION of the source of heat for the industrial heat-treatment of metals is an economic problem. The final choice should be decided by the economics of the situation, as shown by the over-all cost of the product for the different forms of heat. The mere fact that a heat unit in fuel oil may cost two or three times as much as a heat unit in coal does not necessarily indicate that coal is the proper fuel. Oil can be burned much more efficiently than coal at a lower labor cost. If the heat-treating department of a plant decides that oil is the cheapest for heat-treating, it does not necessarily mean that the company will show greater yearly profit by its use. It is not a question of individual process economy, it is a question of over-all economy.

Among the items which influence over-all cost are: Fuel, power, labor, cleaning of product, maintenance, capital charges, storage of raw material and finished product, dollar value of quality and rejections, straight-line production, machining, and working conditions. Many industrial fuel engineers tend to over-emphasize B.t.u. cost in making cost comparisons of various fuels, and when considering their pet fuel in comparison with electricity, seldom get any further. Some inexperienced industrial electric heating engineers over-emphasize the intangible advantages of electric heat. Neither argument can stand up in the face of the over-all economic situation. Lower cost per B.t.u. means nothing, if inefficient utilization, higher labor cost, and greater spoilage result in less profitable operation, just as the admitted intangible advantages of electric heat are worthless if they do not produce a saving in over-all costs and increased profits.

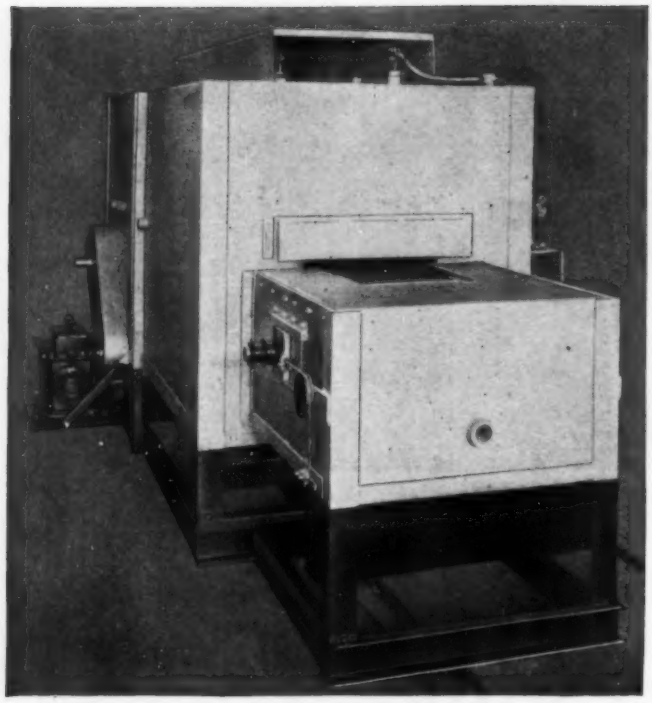
If the intangible advantages are real advantages, they will in some way affect costs. The heat chosen must result in the lowest over-all cost, or it will be displaced eventually by some more economical form of heat. The sales enthusiasm of the public utility or the furnace manufacturer, has sometimes resulted in disregard of the economics of the situation, followed invariably by removal of the furnace and loss of the heating load. A careful, truthful analysis of the whole manufacturing process from the heat-treatment operation to shipment of the finished product would have removed the difficulty in the first place.

Sometimes, an uneconomical application results from a persistent leaning of the manufacturer toward one form of fuel. A few years ago, it was not unusual to find a factory using only one source of heat for many different heat-treating operations. This tendency is disappearing rapidly as it has become more generally realized that a heat well suited to one operation may not fit another.

For example, local economic conditions in Connecticut are favorable to electric heat treatment and are becoming increasingly favorable to the use of gas. Most of our industries are metal working, and many are highly specialized branches of the metal-working industry in which quality is of major importance. It is only natural that there should be a local trend toward the use of electricity and gas for heat treatment, as in general, economic conditions provide a sound basis for this trend.

Electric furnaces are in operation for annealing, hardening, and tempering steel, the bright annealing of copper and nickel silver, and annealing brass. Gas is used for hardening, tempering, and carburizing of steel, for annealing of nickel-silver shells, and more recently, for large production annealing of brass. Oil furnaces anneal, harden, temper, and carburize steel and anneal brass, copper, and malleable iron in the large rolling mills. Coal is used only for the annealing of malleable iron and

Abstract of a paper presented at a meeting of the New York Section, A.S.S.T., on Dec. 9.



A General Electric conveyor-type electric furnace for heat-treating small parts

steel, but there are still a few coal-fired carburizing furnaces and brass annealing furnaces. We still have the most ancient of fuels, wood, in use on a large scale for the finishing anneal of brass sheets in the large rolling mills. It appears that this may be replaced by city gas.

From a production standpoint, the two most important applications of annealing of steel in Connecticut are in the ball-bearing industry and in the cold-rolled steel industry. Two ball-bearing manufacturers use oil for annealing and the third now does all annealing with electricity. This manufacturer now has in operation an installed capacity of 1,200 kw. in eight 150-kw. electric furnaces, all of which operate off peak at night so that the furnaces create no additional demand and the cost of power is 9 mills per kilowatt-hour.

Another important annealing operation in the industries of Connecticut is the bright annealing of cold-rolled sheet steel. The trend from coal to oil and to electricity is shown in these plants. Of three manufacturers using coal five years ago, two are now using both coal and oil, and a third is using electricity entirely.

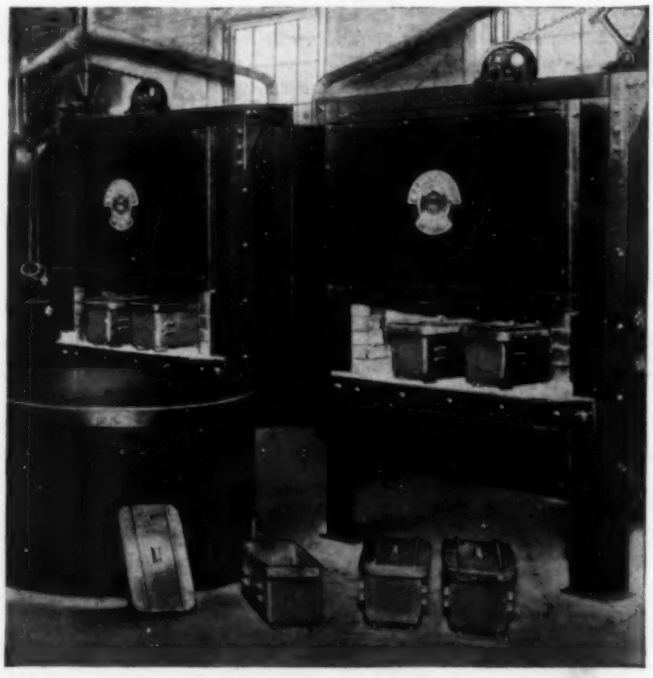
During recent years, a considerable number of coal- and oil-fired furnaces used for carburizing have been replaced by electric furnaces. Viewed from a general standpoint, it seems somewhat difficult to justify some of these installations on an economic basis, but as the number of installations continues to grow, it is evident that the individual manufacturer thinks that in getting an improved product, there results a saving in over-all cost which justifies the investment. Also, in many of these installations, carburizing is conducted only at night, which with the form of power rate prevailing in most of the large cities of the State, results in an energy cost of from 0.8 cent to 1 cent per kilowatt-hour. On this basis the heat cost for electric heating is closely competitive with oil and probably cheaper than coal, when the labor for coal firing is taken into account.

In recent years, a large number of oil-fired hardening furnaces have been replaced in Connecticut by gas or electric furnaces. In some localities, there is a decided trend toward electricity and in others the use of gas is expanding more rapidly. These changes have been particularly true in the case of industries having a large quantity of production hardening.

After several years of investigation, electric hardening furnaces are being introduced rapidly into the ball-bearing industry. Five large plants now either have their hardening department completely electrified or equipment purchased for so doing. In four of these cases, electricity is replacing oil, and in the fifth, gas. In the fifth case, the electric furnace eliminated rejections of the races for improper hardening in this plant, and since the complete hardening room is now electrified, a considerable saving in labor has resulted. This plant also does all of its drawing in electric furnaces of the forced air circulation type, which replaced gas-heated oil baths. With the exception of gas-fired, rotary-drum furnaces purchased a short time ago, and which are now being replaced by electric rotary-drum furnaces, all heat-treating in this plant is performed in electric furnaces—hardening, drawing, annealing, and carburizing.

In the plant of a large spring manufacturer, a gas-heated, modern, belt-type furnace is operating very successfully on production hardening of small pieces. An additional unit is being added. Gas in this case replaces oil. This same manufacturer has a large number of gas-fired lead pots for the continuous hardening and drawing of strip steel. These pots operate very successfully and show a considerable saving over the oil pots formerly used, because of lower maintenance cost. This concern used oil for large production annealing and for some of its hardening, and gas for lead-pot hardening and drawing. Each time a new application has arisen, the company has investigated electricity as well as gas, but for their local situation they feel that gas is considerably more economical than electricity. This situation is accentuated by the fact that they are a comparatively small power user, but a very large gas consumer.

Oil for annealing in the breaking-down operations and



A pair of Rockwell oil-burning, inclosed-front, heat-treating and carburizing furnaces

wood for the finishing anneal are the basic fuels for Connecticut brass rolling mills, although some coal is used. The most important development of the past year in rolling-mill annealing has been the installation of a large continuous furnace, heated with city gas for annealing coiled brass sheets, replacing wood on the finishing anneal. The installation has been so successful that the use of gas for the operation may extend rapidly, and under suitable local economic conditions, may replace oil for all rolling-mill annealing in some mills. A bright anneal is not being obtained, but the finish of the brass is superior to the product of the wood muffles.

Electricity was considered for this operation and it appears has been rejected, because the finish obtained was not as good as that with gas. One objection was the effect of grease and dirt on the brass entering the annealing furnace. In the electric furnace, the dirt is not oxidized or burnt off as in the combustion furnace and, therefore, tends to bake onto the brass.

Measurable progress has been made in the atmospheric control of electric furnaces for bright-annealing copper. Oil continues to be the fuel of the eastern rolling mills, but electricity is still extending rapidly for annealing seamless tubing, coiled sheets, and wire. Recently, continuous electric furnaces of the tube type have been built for bright annealing of copper tubing in an atmosphere of steam or some non-reducing gas. Pit-type electric furnaces of the retort type are now in use for bright-annealing coil copper sheets in an atmosphere of steam. A properly constructed water-sealed electric furnace has little maintenance expense, as shown by the fact that two furnaces installed in Waterbury five years ago have operated continuously without coil burn-out or other maintenance expense. It would seem, however, that the continuous-tube furnace or the retort pit furnace using steam as an atmosphere has still greater possibilities in reduction of operating cost.

For annealing of nickel-silver stampings, installations of electric furnaces continue to increase, but the use of water-sealed furnaces for this purpose does not seem to be extending as rapidly as formerly in this country. The modern gas continuous-belt furnace is being considered for this application because it is possible to produce as clean a product as in the water-sealed electric furnace at a lower cost, depending, of course, on the local economic situation. Continuous-belt electric furnaces with a seal of burning city gas at the incoming end and a water seal on the other end are now being built, and produce as clean a product as the continuous-belt type gas furnace. Both the electric- and gas-furnace products require some pickling. Further advance has been made in the introduction of the hydrogen-filled pusher-type electrical furnace which produces an absolutely clean product and eliminates pickling.

Today, more than ever, metal-working industries realize the importance of heat-treating in their operations. It is now generally understood that a comparison of costs of sources of heat on a thermal basis means nothing without a complete investigation of over-all costs. Even if such an investigation leads to no change in the source of heat, it is well worth while, because it invariably results in the discovery of little realized weak parts of the plant practice which influence production costs materially. Selection of the source of heat treating is an economic problem with the final choice depending on the local economics, as shown by the over-all cost of the finished product with the different forms of heat.

SEEN · AND · HEARD

By JOHN R. GODFREY

Only Counting Net Results—More About Tungsten-Carbide Tools

SPENDING money involves more or less pain to many of us whether we be natives of Scotland or elsewhere. Nor is this altogether as reprehensible as many would have us believe. The main objection is that it frequently cramps our judgment as to selecting new tools or materials if the price is a trifle higher than we have been accustomed to pay.

New cutting tools, ground taps, and the like, are usually handicapped because the prices are of necessity, higher than those with which we may have been familiar. Or perhaps we might say that the handicap is on us, because we deprive ourselves of their benefits on account of the tenderness of the pocket-book nerve.

Having mentioned ground taps, they will serve as a good example of just what is meant. Counted on the basis of "taps is taps," the price seems high. But if we are to believe the testimony of users who are very canny as to parting with hard-earned dollars, the extra cost is warranted. From England comes a corroboration of the claim that they save inspection costs. And others tell of savings by the avoidance of retapping.

There are many other similar cases. First cost plays much too big a part in the selection of tools and materials, and we frequently lose time and money before we decide to spend the extra cash required. When we get to the point where we can count on net results only, we are near to being a real manager.

* * * *

MANY are still debating just what effect the coming of tungsten-carbide tools will have on machine-tool design and construction. Now that the first flurry of excitement is over, it is of interest to note the reactions of both users and builders of machines. In spite of some failures, it is safe to predict that more of these tools will be used, even if the price does not come down. The changes that seem likely are considerably higher cutting speeds with somewhat lighter cuts. While more power will be required, there will be much less change in machine-design necessary than when high-speed steel supplanted the old carbon tools. Gearing and drive shafts may have to be made of even better materials than at present, tool-holding devices made more rigid to prevent vibration of the tool, the work may have to be more firmly held, and the steady- or back-rest be used more than at present. Machines will be designed with even more care to prevent springing. But, after we have found the practical limits in speed for the materials in general use, there seems little necessity for any such radical machine-changes as came with the advent of high-speed steel. It is never advisable to be too self-satisfied, neither is it wise to be stampeded into making changes that may not be necessary.

IDEAS FROM PRACTICAL MEN

The department, "IDEAS FROM PRACTICAL MEN," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit.

Grinding Fixture for an Odd-Shaped Casting

F. J. OLIVER, JR.
Western Editor, American Machinist

IN THE several illustrations is shown a device used to facilitate the grinding of Franklin, fire-door cylinders on a Micro internal grinder. The fixture was developed in the shops of the Chicago & North Western Railway Company. It insures the positive alignment of an odd-shaped piece. In Fig. 1 the cylinder casting is shown

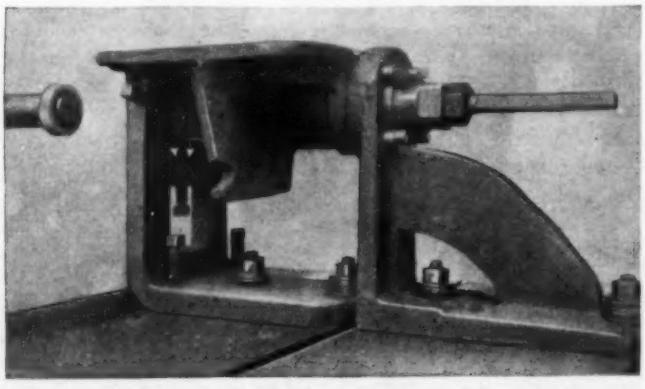


Fig. 1—Fire door cylinder casting set-up ready for internal grinding operation

mounted in place ready for the grinding operation, while in Fig. 2 a better idea of the construction is given. The rear post is a casting; the front one is made of boiler plate bent to a right angle and cut to shape with an oxy-gen torch. In Fig. 3 is shown a close-up view of the expanding mandrel upon which the casting is centralized.

In setting up, the two support brackets are first fastened

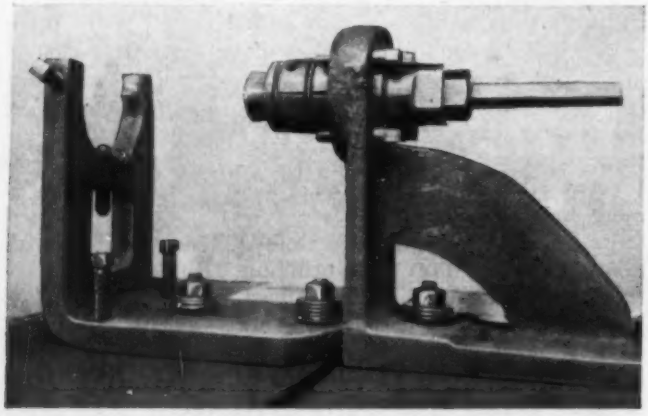


Fig. 2—Details of the fixture

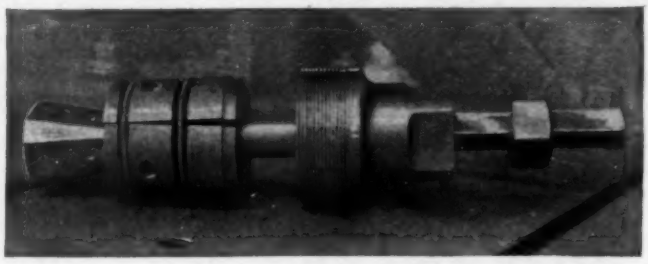


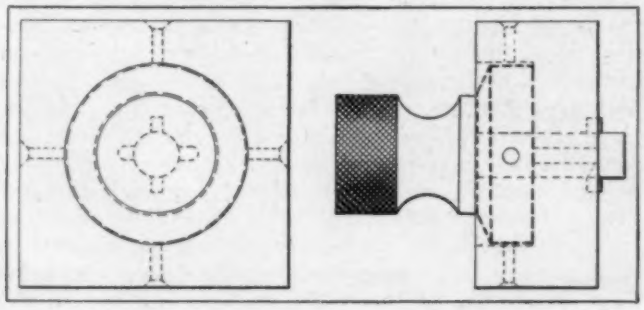
Fig. 3—Construction of the holding mandrel

to the table approximately in line, a tongue and groove being used to make certain that the rear bracket is in line with the grinder spindle. Next, the mandrel is mounted in place by screwing the large diameter sleeve into the bracket. The cylinder casting may now be slipped over the mandrel, which is then tightened through the small nut and draw bolt with its four-sided wedge end. While the casting is thus held central, with its axis horizontal and in line with the machine spindle, the three setscrews in the front yoke are tightened against the casting, and the four square-end bolts in the rear bracket are screwed into corresponding cover bolt holes in the casting. These holding bolts have a small amount of radial play in the bracket, so that they do not prevent the mandrel centering the casting. When everything is tight the mandrel is loosened and is removed from the bracket entirely by unscrewing its holding sleeve. In this way it is possible to grind the cylinder clear through at one setting.

A Quick-Acting Clamping Device

BY L. O. BROWN
Toolroom Foreman, Holcomb & Hoke Manufacturing Company

In meeting a demand from the shop for a simple jig for a rush job, I developed a clamping device that is very simple, positive, fast in action, and foolproof. Since then I have used the device on a number of jigs. I suppose it could be considered a modification of the bayonet lock, though I have never seen anything quite like it.



Simple jig with quick-acting lock

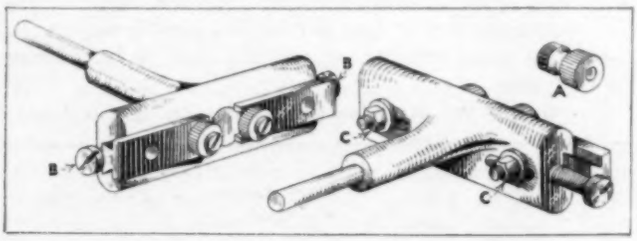
The jig, as shown in the illustration, has a hole through the base and two slots at the sides, while at the bottom are two cam surfaces. A pin, fitting the hole in the jig, has a crosspin near one end and a shoulder terminating in a knob at the other end. The distance between the crosspin and the under side of the knob is such that when the work and the pin are in the jig, a part revolution of the knob engages the crosspin with the cam surfaces, drawing the under side of the knob against work, holding it tightly in place. Two combined, natural movements only are required to operate the lock; push the pin in as far as it will go, and twist the knob.

In making the jig, after the hole and the slots were finished, the jig was chucked in the lathe. With the lathe geared to cut eight threads per inch, the two cam surfaces were cut from slot to slot in the same manner as a double thread would be cut, except that the lathe spindle was revolved by pulling on the belt, instead of by power.

Knurling Tool for Use in a Turret

By Charles H. Willey
Asst. Plant Supt., Hoyt Electrical Works

While I have noted several types of knurling tools for the toolposts of lathes and for the cross-slides of screw machines, in the pages of the *American Machinist*, as yet I have not seen one for use in a turret. A type of knurling tool that we have used very successfully in our work of knurling binding-post nuts of the kind shown at *A*, is illustrated.



Turret knurling tool

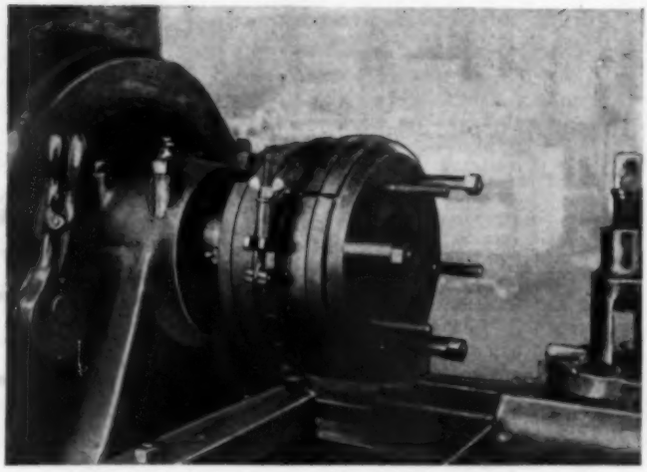
The tool carries two knurls mounted on dovetail slides in the holder. Both knurls are adjustable for diameter by the screws *B*, and are locked in position by the nuts on the studs *C*. The holder is bored out for a short distance to permit entry of the work. This is only possible, of course, with a straight knurl.

Chuck for Turning Valve Rings

H. P. Leonard

The special chuck shown in the illustration is used in the shop of the Chicago & North Western Railway to hold valve rings while they are being turned to fit the sleeve in the steam chest. A pin gage is used to check the inside diameter of the sleeve, and the rings are made 0.005 in. larger to allow for initial wear of the high spots.

Four rings are accommodated at a time on the chuck, which is screwed onto the lathe spindle. The rings rest on a cylindrical part of the chuck and are held against a shoulder at one end through a clamp plate *A* at the other. Studs protrude through this plate, and spacers of varying height are used under the nuts, depending upon the width of rings being turned. As cast, the rings are larger in diameter by about $\frac{1}{4}$ in., and must be pulled together at the slot by a clamp arrangement. As can be seen, the clamp is a flexible steel strap which is drawn tight by the hinged eyebolt and wing nut. One clamp takes care of two rings, and when the ends of both pairs of rings are closed to within $\frac{1}{8}$ in., the stud nuts are tightened. After that the band clamps may be removed and the rings turned to the desired diameter.



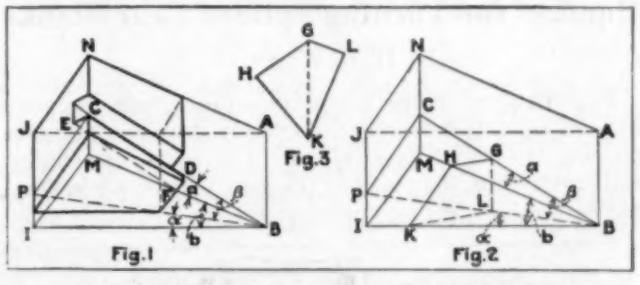
Chuck for turning valve rings, showing band clamp for setting rings in place

A Problem in Shaper Work
Discussion

By A. R. Klingman

In Vol. 71, p. 294, of the *American Machinist* you reported the problem in shaper work which Mr. James Henderson came across, together with his solution of it. It represents an interesting case in which a bit of trigonometry applied to solids gives the correct answer.

While Mr. Henderson's statement regarding the two "limit" positions of the groove (at 0 deg. and 90 deg. with the sides of the body) is correct, his inference concerning the intermediate direction of the groove, as expressed in proportion 90 deg. : 30 deg. : : 30 deg. : x



Diagrams illustrating the geometry of the problem

deg., is wrong because it arbitrarily establishes a "straight line" relationship between this angle and *x*.

For the benefit of those who might have been thus misled, I am giving below what seems to me to be a correct solution of the problem. To facilitate the solution, extend the base plane *ABIJ*, Fig. 1, and the grooved top of the body plane *ABMN* until they intersect along line *AB*. Through the point *B* where the line *CD* intersects *AB*, draw the plane *BMI* perpendicular to *ABIJ*. Through any point *G*, Fig. 2, on

BC draw plane $GHKL$ perpendicular to BC. Then the linear angle HGL, Fig. 2, corresponding to solid angle formed by planes $ABMN$ and $CDEF$, Fig. 1, is the angle to which the shaper head is to be swung.

It follows from the data given and the construction that:

(1) Plane $GHKL$ is perpendicular to line CB
(2) Plane MBI is perpendicular to plane $ABIJ$
(3) Plane $MNJI$ is perpendicular to plane $ABIJ$
(4) Plane $MNJI$ is perpendicular to plane MBI
(5) Plane $ABMN$ is perpendicular to plane MBI
(6) Plane $ABMN$ is perpendicular to plane $HGKL$
(7) Plane $ABIJ$ is perpendicular to plane BCP
(8) Plane $HGLK$ is perpendicular to plane BCP

It follows then, that all the angles listed below and marked on Fig. 2 are right angles:

PIM, MIB and PIB.....from (2) (3) and (4)
KHB and KHG.....from (5) and (6)
KLB and KLG.....from (7) and (8)
CPB and CPI.....from (7) and (3)
HGB and LGB.....from (1)
NMB and NMI.....from (4) and (5)

To find angle HGL, we must have all the linear elements in quadrangle $GHKL$. Taking length of GB for a unit, we can express two of these elements in terms of given angles:

$$HG = \tan a;\ HK = HB \times \tan b = \tan b \div \cos a;$$

To express two remaining sides of $GHKL$ in terms of a and b, the values of α and β must be found.

Taking BI for a unit we get:

$PI = \tan a$; $CM = MB \times \tan a = \tan a \div \cos b$; but $PI = CM$, therefore $\tan \alpha = \tan a \div \cos b$; $MI = \tan b$; $PC = BC \times \sin \beta = \sin \beta \div \cos a \times \cos b$; but $MI = PC$, therefore $\sin \beta = \tan b \times \cos a \times \cos b = \sin b \times \cos a$;

Thus:

$GL = \tan \beta = \sin b \times \cos a \div \cos \beta$; $KL = LB \times \tan \alpha = \tan \alpha \div \cos \beta = \tan a \div \cos b \times \cos \beta$.

Having found the length of all four sides in Fig. 3 we get:

Angle $HGL = \tan^{-1}(HK \div HG) + \tan^{-1}(KL \div LG) = \tan^{-1}(\tan b \div \cos a \times \tan a) + \tan^{-1}(\tan a \times \cos \beta \div \cos b \times \cos \beta \times \sin b \times \cos a) = \tan^{-1}(\tan b \div \sin a) + \tan^{-1}(\tan a \div \sin b \times \cos b \times \cos a)$.

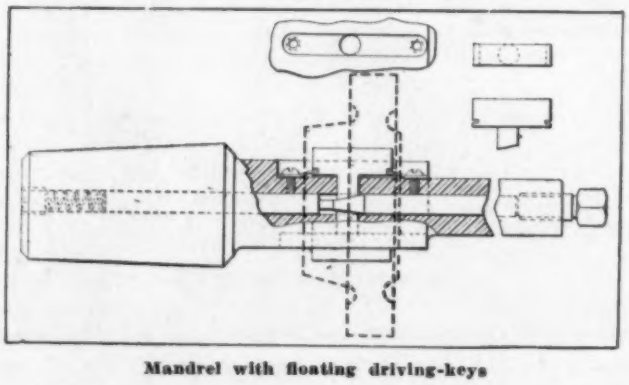
In the particular case when: $a = b = 30$ deg.

Angle $HGL = \tan(1 \div \cos 30 \text{ deg.}) + \tan^{-1}[1 \div (\cos 30 \text{ deg.})^2] = 106$ deg. 6 min., or the shaper head is to be set at 16 deg. 6 min., with the vertical.

Mandrel for Turning Splined Gear Blanks

By H. L. Wheeler

The mandrel shown in the illustration was designed for use on a two-spindle turret lathe for quantity production of splined gear blanks. The large diameter of the mandrel fits the bores of the gear blanks, while floating keys engage the two opposite splines and do the driving. The keys are expanded by means of a sliding pin tapered at one end and actuated by a setscrew in the outer end of the mandrel. In the opposite end of the mandrel is another sliding pin, backed by a spring the function of which is to push back the pin with the tapered end and allow the keys to return to their lowest positions for removing the work.



Mandrel with floating driving-keys

The keys are hardened and ground to a nice fit in the seats milled in the mandrel, and are each held in place by two spring clips and screws, the clips engaging slots cut in both ends of the keys.

The outer end of the mandrel is made to fit a bushing held in the turret, and enters the bushing as the tools are brought up to the work. Two mandrels are used, one on each spindle. The operation consists of turning and facing both sides of two blanks simultaneously.

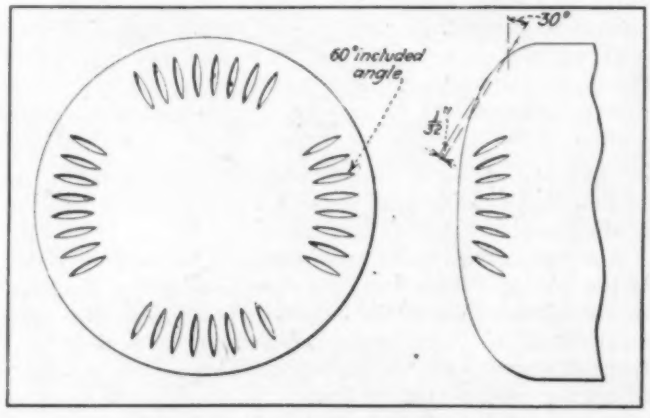
Preventing Blanks From Slipping in Drawing

By F. J. Cawley

Tool & Die Foreman, Schlage Lock Company

We had considerable trouble in drawing some cups from double-run material. The trouble was caused by the material being unusually heavier in the center than at the edges, leaving the blanks with two thin and two thick edges. In drawing the cups, the resistance of the thick edges seemed to pull the blanks out of the center, so that an extra amount of material had to be allowed for trimming.

To remedy the trouble, four series of notches were ground in the end of the cupping punch, as shown in the illustration. In drawing, the metal was forced into the notches, keeping the blank from slipping. No visible impressions were left on the outsides of the cups, so that the finish was not marred. Punches so ground have made trimming unnecessary in many cases.



Punch ground to prevent slippage of blanks

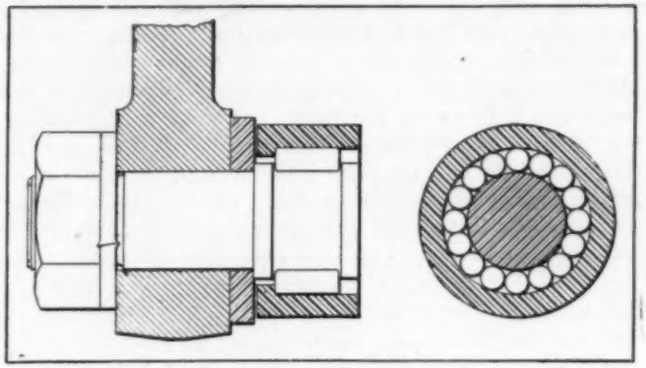
Cam Roller With Roller Bearing

By Peter A. Brill

Tool Designer, Taft-Peirce Manufacturing Company

The construction shown in the sketch may be used for a cam roller the diameter of which is too small to permit the use of a standard ball-bearing, and in places where end thrust does not have to be provided for. The sketch shows clearly that all the parts can be assembled before

the stud is pressed into its seat, and that after assembly of the whole unit in the roller arm, the cam roller, which forms the outer race, will be confined between the ends of the bearing rollers and the washer next to the arm.



Cam roller fitted with a roller bearing

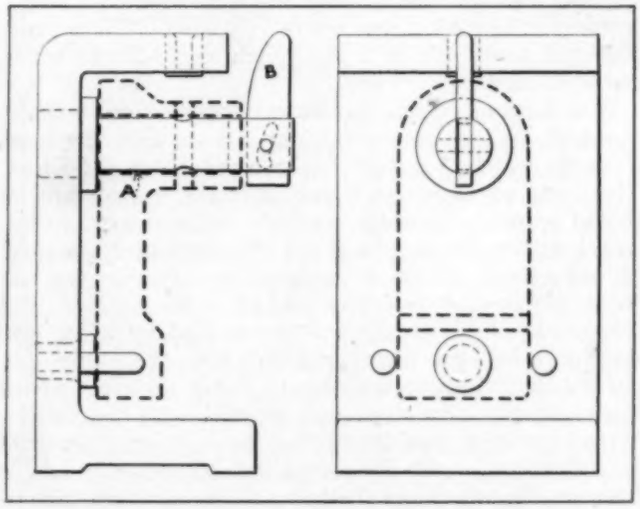
Very little clearance should be allowed between the bearing rollers, otherwise an equal spacing of the rollers will not be maintained. All running surfaces should be carefully ground.

A Quick-Acting Locking Lever

By C. W. Hinman
Chief Tool Designer, Kobzy Tool Company

When work is located from a previously-drilled hole ½ in. or more in diameter, the locking device shown in the illustration can be used with good results. The work, shown in heavy dotted lines, is locked on the stud *A* by the lever *B* in which there is an angular slot engaging a pin through the stud.

To remove the work, the lever is pulled up and turned until it is at right angles with the stud, when the work



Quick-acting locking lever for a jig

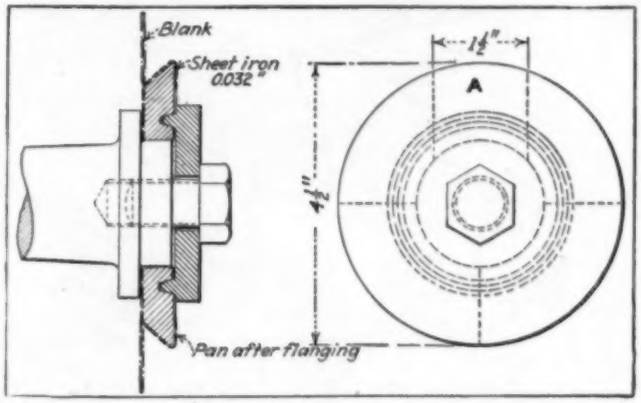
can easily be slipped off. With the lever in this position, work can be entered upon the stud where it can be locked by turning the lever to the position shown in the illustration and by pushing it down endwise. The good features of this arrangement are that there are no screws nor nuts to turn and no loose parts to be lost. The device is quick-acting in every respect, and is easily and quickly made.

Flanging Splash Pans on a Lathe

By Reinhold Koch

We had an order for circular, return-flange, sheet-iron splash pans as shown by heavy dotted lines in the illustration. As the quantity ordered was less than 1,000, there were not enough to warrant the buying of expensive special tools, and we did have a lathe.

The pan stock was cut in roughly octagonal pieces, the central hole and the three screw-holes being punched in one operation. The pieces were put on the flanging mandrel shown, which was held in the spindle of a turret lathe, and were flanged by a roller tool held in the front toolblock on the cross slide. After each piece had been flanged, the surplus stock was trimmed off by a parting



Mandrel on which the flanging was done

tool held in the rear toolblock. The forming plate of the mandrel was made in five pieces, all of which were held in place by the special clamp shown.

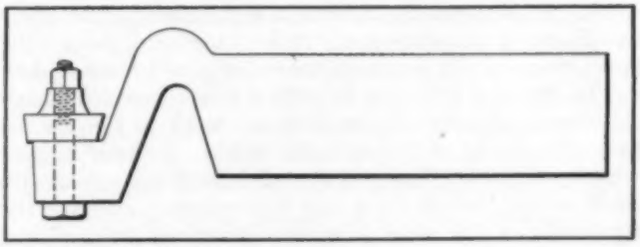
Upon completion of each piece, the clamp was taken off and piece *A* of the forming plate slid toward the center until it cleared the flange of the pan and was removed. With the piece *A* out of the way, the remaining pieces were easily removed, thus clearing the work.

A Spring Tool for Turning Fillets

By John Place

In turning the crankpins of crankshafts for automotive engines, it is necessary for the fillets at the ends of the pins to be true arcs of circles, and all of the same radius. By the use of the ordinary spring tool, it was found that too much time was wasted in grinding and honing, also, that the cutting results were not always satisfactory.

The tool shown in the illustration consists of a spring toolholder on which is mounted a circular cutter. When



Spring tool with circular cutter

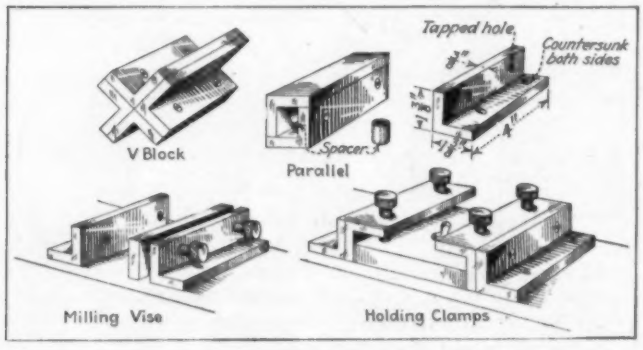
the cutter gets dull in one place, it can be turned so as to bring a sharp surface in position for cutting. The washer over the cutter is quite thick and is filleted so that the chips will not cling to it. The cutter is easily made and a number of them of different radii can be kept in stock.

Tools of this kind have given excellent results, making fillets that are oil tight. They can be used as either right- or left-hand tools.

Handy Angle Irons

By Charles H. Willey
Asst. Plant Superintendent, Hoyt Electrical Works

There are many uses for a set of four angle irons such as those shown in the illustration. These particular angle irons were made in my apprentice days. It was my first lesson in planning and laying out holes. The several



Small angle iron set for various toolroom uses

sketches show some of the uses to which the angles may be put, when used in conjunction with spacers and screws. Of course, not being ground, their use as very accurate parallels is limited, but the owner of a set will find them quite handy.

Thread Rolling on the Screw Machine
Discussion

By C. A. Coppack
Leicester, England

The article by H. M. Darling, under the title given above, on page 559 of the *American Machinist*, interested me greatly. I, too, have been unable to find any data on the subject that is of any real use to me.

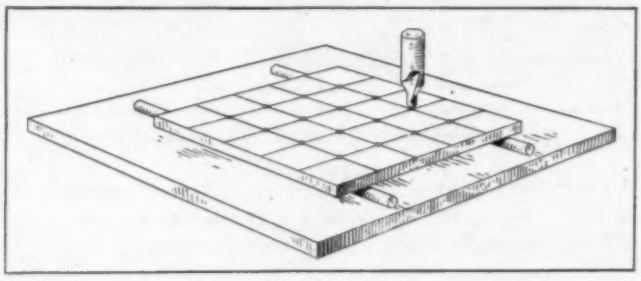
The formula giving the diameter of the pitch circle on the roll as a multiple of the diameter of the pitch circle on the work is not correct. According to Brown & Sharpe, the pitch diameter of the roll is something less than a multiple of the pitch diameter of the screw. The diameter of the blank is a very important item, and can make or mar the finish of the product. For rough work, the diameter is preferably left small, as the effective diameter can more easily be kept uniform, though the appearance of the crests of the threads will not be good.

The greatest difficulty in rolling fine threads of small diameter is the inability to keep the work to size, as the pressure of the roll flexes the stock. I think anyone who has had experience in thread rolling will agree with me that any formulas are only approximate, and that the final sizes of the work must be determined by trial and error. At least, that has been my experience.

Accurate Drilling of Small Holes

By C. Kugler
Toolroom, General Electric Co., Philadelphia Plant

In drilling holes to a layout, on the drill press, I have found that much of the inaccuracy results from the work being so heavy that it does not center itself readily. When the drill press table is in good condition, I use four steel balls under the work, but since this is seldom the case, I generally use two pieces of drill rod, as shown in the illustration. The center drill, revolving at high speed, will center itself and follow the layout more readily than if it were necessary to shift the work



Making die and jig parts self-centering

by hand until it comes in line with the center drill. Since the effect of rolling friction is much less than that of sliding friction, this method produces greater accuracy than if done otherwise.

Cutting a Double-Thread Wormwheel With a Single-Thread Hob

By Charles B. Irmer
Moerk and Irmer, Engineers

Some time ago, I was connected with an organization building various lines of equipment in which a 72 to 1 worm-gear reduction was extensively used. The gearing consisted essentially of a ¼-in. pitch single-thread worm and a 72-tooth wormwheel.

It so happened that a special reducing gear was wanted, in which the general overall dimensions were the same as in the standard unit, but with a reduction of 36 to 1. This ratio of reduction necessitated the use of double-thread gearing. In order to cut the double-thread wormwheel with a single-thread hob, the only tool available, the wheel was set at an angle with respect to the hob while the teeth were being hobbed in the miller. The magnitude of this angle was determined by taking the difference between the thread angles of the single- and the double-thread worms, namely, 2 deg. 10 min. When the resultant wormwheel was checked with the double-thread worm, it was found that its shaft was not quite at a right angle with the worm, indicating that the angle between the wheel and the hob was not correct. Subsequent manipulation showed that the proper angle was slightly more than 3 deg.

While I do not cite this procedure as being an absolutely correct method of producing a double-thread wormwheel, I do think that it is a procedure well worth remembering when a special problem must be solved, and the proper tools are not available. It may, however, be stated that the installation in question was made in duplicate in the year 1921, one machine having seen 24-hour continuous service ever since.

Industrial Diamonds

Physical Characteristics

DIAMONDS have been used by industry for the last 40 years, first as a medium for truing grinding wheels, later for fine grinding, and more recently, for boring and forming tools. The diamond is used today in the manufacture of automobiles and parts, electrical apparatus, machinery and machine tools, sewing and talking machines, radios, telephones, scientific apparatus, and metering and measuring devices.

The industrial diamond differs widely from its blood brother, the gem. It depends for its value chiefly on its physical quality of hardness. Although it is true that diamonds vary slightly in this characteristic, the difference between the hardest and softest is negligible for ordinary industrial operations, because the material upon which a diamond is used is so much softer than even the softest diamond. Therefore, stones are graded and priced according to size, origin, color, shape, cleavage, and imperfections.

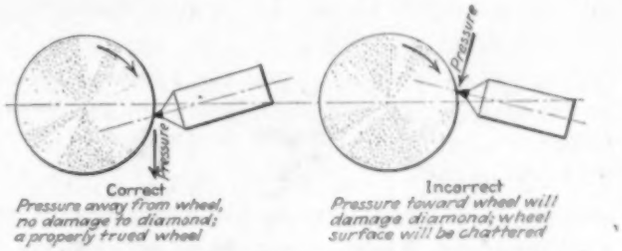
The chief concern of the industrial buyer is to obtain stones that will give him the lowest unit operating expense. It is not uncommon to find small and inferior stones in use on work for which they are wholly unfitted, when a larger and more costly stone would do the job more efficiently, would last proportionately longer than the smaller one, and would cost less in the long run. Conversely, it is found occasionally that the higher-priced stones are assigned to work which could just as well be handled with cheaper grades. Since industrial buyers have neither time nor opportunity to make detailed studies of diamonds, they can do well to trust the work to an expert.

Application to Wheel Truing

Unit costs for diamond work depend not only on the initial cost of stones and settings, but also on the degree of care with which the tools are handled and on the condition of the machine in which they are used. Since the diamond is a very hard substance, it is brittle. It is apparent, then, that in the use of a diamond, care should be taken to guard it against shock. A great many diamonds have been cracked by an inexperienced operator's striking them against the side of a grinding wheel. When a wheel-truing diamond is brought into contact with the wheel above the horizontal center line through the wheel's axis, it is almost impossible to avoid breakage. The accompanying illustrations indicate correct and incorrect positions of the tool in truing a wheel.

Both wheel and diamond tool should be flooded with cooling lubricant. The diamond should be advanced slowly until it touches the center of the wheel face. Cuts should be started always in the center, because the wheel is usually worn away at the corners, and consequently cuts started at the corner would gain in depth toward the center, resulting in damage to the diamond tool. Passes across the wheel face are made first to the left, then to the right, until the wheel is trued.

It is extremely important to take light cuts, of not more than 0.002 inch deep. A heavy cut increases unduly the heat generated in the stone by its cutting friction, and as a result the stone expands, the resulting stresses being often great enough to split the stone, since the cooling lubricant stream on the setting prevents it from expanding proportionately to the stone. If the diamond does become unduly heated, it is important never to quench it.


Pressure
Correct
Pressure away from wheel, no damage to diamond; a properly trued wheel
Pressure
Incorrect
Pressure toward wheel will damage diamond; wheel surface will be chattered

Proper and Improper Methods of Truing a Wheel

After the wheel is trued, the diamond nib should be turned slightly in its holder so as to present a different contact face for the next operation. The diamond toolholder is usually arranged in such a manner on a machine that by turning the tool slightly in its holder, the diamond will be kept in the best possible condition to perform the work expected of it.

The diamond is not a device for sharpening a wheel, but rather for correcting its surface. When a diamond has become dulled, it should be reset immediately. Under no circumstances should the metal of the setting be filed away to expose more of the stone, unless it is a setting especially designed for such handling. The setting has an important function in keeping the stone fixed rigidly to the tool, and any alteration of the setting jeopardizes its safety. A loose diamond is easily dislodged and lost. It is poor economy to use up a diamond without remounting it one or more times, since it is far cheaper to remount a diamond and expose a new sharp point than it is to force it in an endeavor to make it cut. Under such stresses, it is likely to become overheated and to break, thus proving a total loss.

Most industrial diamonds of the present day are set in the solid metal which is an integral part of the tool. For average work, a copper-alloy mounting is used which is sufficiently hard to withstand any pressure that may be brought to bear upon it. This metal meets all the usual requirements of strength, hardness, and durability. Where extremely hard usage is expected, steel is recommended in place of this alloy.

Courtesy of the Wheel Trueing Company, Detroit

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American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

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Losses From Defective Work

WHAT IS the average percentage of defective work? Can anyone answer? Is there any average? Since percentages in connection with almost any problem can be most misleading, they can mean much or little when applied to defective work, depending upon one's knowledge of the underlying facts and the way in which the facts are used.

One statement gives two per cent as a probable average for defective work, but it does not state whether two per cent refers to the cost of direct labor, of material, or of both. The question also arises whether the percentage of the total cost, which must include overhead, should be considered.

Obviously any losses will vary with the nature, complexity, and refinement of particular work. More defects will be found in castings than in forging or bar stock; spoilage will be higher in some departments than others, and its cost will vary with the cost of material and labor, and with the amount of work that has been done before the spoilage takes place.

Considering the different phases of the question it is difficult to see how a worth while general average for defective work can be established. Though we have figures running from one-half of one per cent to ten per cent, they mean little unless they are interpreted in terms of particular work and of a particular shop.

*

A Peacetime Call

THE War Department desires an additional number of reserve officers for assignment to various units in the Procurement Service. Appointments will be made gradually by careful selection and will be limited to applicants whose experience in business and industry especially qualifies them for service in the procurement of war time supplies under the Industrial Mobilization Plans created by the National Defense Act.

Seven branches of the army constitute the purchasing divisions of the service, the Air Corps, Chemical Warfare Service, Engineer Corps, Medical Department, Ordnance Department, Quartermaster Corps, and Signal Corps. They are all under the control of the Assistant Secretary of War as chief purchasing agent. Each of these supply branches has established local buying offices in some or all of fourteen regional offices established in the major markets of the country. The personnel assigned to the district office of any one supply branch form an army unit known as a procurement district. In peace time such a district consists of a regular army officer, civilian assistants, and Reserve Corps officers, who in the event of an emergency would be ordered to active duty.

Active duty training for reserve officers consists of the study of office routine, and actual contact with industry. Many types of men and many qualifications are needed in the Procurement Service, including industrial engineers, inspectors, personnel experts, production specialists familiar with all types of commodities used in war, purchasing officers, and research specialists. Readers of this magazine constitute a logical group from which will come many of the officers. If you feel yourself qulified for such work and have available the small amount of time necessary for active duty each year, write the War Department in Washington for further details. Address your letter to the attention of the chief of the service in which you are most interested.

*

A Matter of Momentum

THEY tell a story of an inebriated gentleman who walked three times around one lone tree and then gave up, exclaiming, "Lost in an impenetrable forest!"

Are some of us making the same mistake with the period in which we now are, magnifying the immediate obstacle of a moderate recession into a prolonged depression? If we are it would be wise to back off a bit and get a comprehensive look at the decade that has just ended. Dr. Julius Klein is doing this in a current series of radio talks, and doing it admirably.

Not until we withdraw far enough to gain perspective can we grasp the significance of the tremendous advances that have been made since 1920. And when we do grasp it we are sure to be impressed with the momentum that is sweeping us steadily forward, and that will carry us over our immediate difficulties with but a brief pause to gather breath.

SHOP EQUIPMENT NEWS

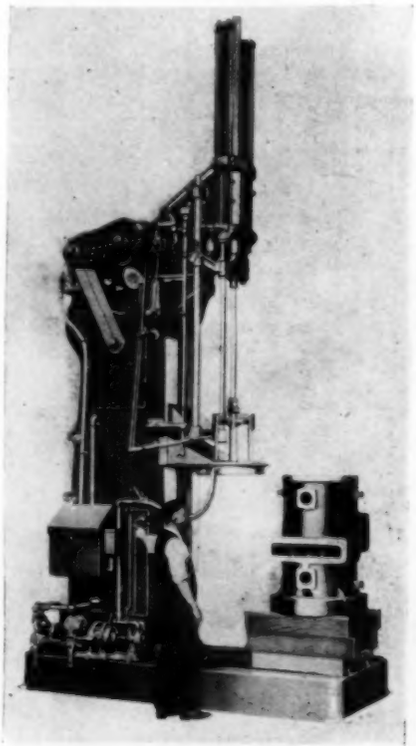
Barnes No. 3620 Hydraulic, Heavy-Duty Vertical Honing Machine

LARGE and comparatively long cylinders, such as those for Diesel engines and air compressors, may be honed on this heavy-duty vertical honing machine, which is equipped with a hydraulically reciprocated spindle. This machine has been developed by the Barnes Drill Company, 814-830 Chestnut St., Rockford, Ill. As here shown, the machine has capacity for castings 36 in. in diameter and will hone cylinders up to 20 in. in diameter by 54 in. long.

Duplex hydraulic cylinders are used for reciprocating the ten-splined spindle; duplex torque bars and a bracket minimize vibration at the various reciprocation speeds. The spindle and hone assembly are balanced pneumatically. Eight quick-change speeds are furnished to the spindle, which rotates in Timken bearings of the self-oiling type. Hydraulic motion for reciprocating the spindle and the application of geared drive for rotating it permit evenness and uniformity of honing over the full length of the cylinder, and the adjustable stroke prevents bell mouth, barrel shape, and taper. A combined control lever is used for the powerful multiple-disk driving clutch, and this lever starts the reciprocations simultaneously with the gear drive.

Large diameter cylinders, if reamed to within 0.005 to 0.008 in. of size, may be honed to within 0.001 in. The long honing stones also pass over the port holes and recesses in the cylinders, leaving a true edge about these openings. Stones range from 4 to 12 in. in length to suit the work done.

Although the standard stroke is 56 in., longer or shorter strokes may be furnished. Height of regular machine to extreme top, with the spindle up, is 18 ft. 8 in. The distance from the center of the spindle to the face of the column is 18 in. With special columns this distance may be increased. Maximum distance from top of table to nose of spindle is 10 ft. 6 in., the driving end of the spindle being 3 in. in diameter. Working surface of the air-operated work table is 30 by 30 in. and the horizontal travel of table on ball bearings is 30 in. With 2 to 1 crown gearing, the the primary spindle speeds are 354, 250, 180, and 128 r.p.m. When back geared, the additional four speeds are: 89, 63, 45, and 32 r.p.m. An Oilgear motor supplies hydraulic power to the spindle for reciprocation purposes, and is driven by a 20-hp. motor at 1,200 r.p.m. This motor also furnishes the spindle speeds. Floor space is about 58 by 117 in., and the weight is approximately 12,000 pounds.



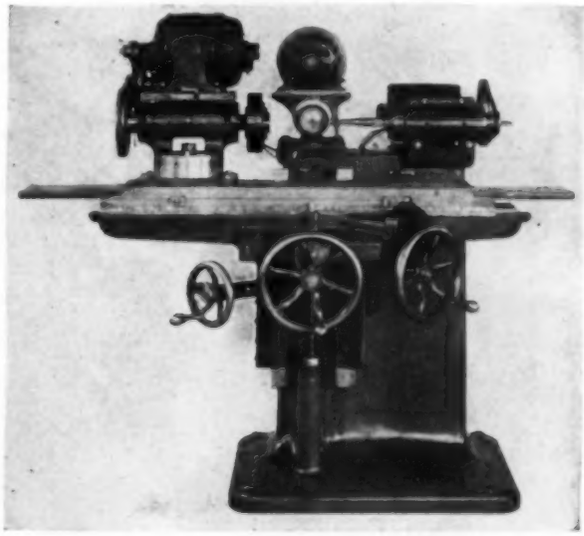
Barnes Hydraulic Vertical Honing Machine, which will take cylinder castings up to 36 in. in outside diameter and hone them 20 in. in internal diameter over a length of 54 inches

Jarecki Internal and Face Grinder

THREE grinding spindles are provided on the internal and face grinder announced by the Jarecki Machine & Tool Company, Hall St. & Steele Ave., S.W., Grand Rapids, Mich. These are a heavy-duty internal grinding spindle, a high-speed internal grinding spindle, and a heavy-duty face grinding spindle. Individual motor drives are furnished for the internal grinding attachment, the face grinding attachment, and the head in order to control the different speeds. Hand feed is furnished ordinarily, but power feed can be furnished specially.

This machine is built so that the operator can use a faceplate for clamping any kind of work. It is equipped with a 7½-in. chuck as well. The head can be set at any angle.

Specifications for internal grinding



Jarecki Internal and Face Grinder, which has both a heavy-duty and a high-speed internal grinding spindle, and a heavy-duty face grinding spindle

are as follows: minimum ¼ in. in diameter by 4 in. in length; maximum 10 in. in diameter by 10 in. in length. Face grinding can be done to 12 in. in diameter. The self-aligning ball bearing heavy-duty internal grinding spindle has four quills ranging from 2½ to 10 in. in length. Speeds range from 2,600 to 5,200 r.p.m. The high-speed internal grinding spindle has three quills ranging from 2 to 6 in. in length, and the speeds range from 10,000 to 15,000 r.p.m. Three quills are also provided on the heavy-duty face grinding spindle, ranging from 2 to 8 in. in length. The speed is 5,600 r.p.m. The heavy-duty chuck spindle has speeds ranging from 80 to 240 r.p.m., and is equipped with a 7½-in., independent, four-jaw chuck.

Other specifications are as follows: vertical movement of bed, 12 in.; longitudinal movement of bed, 24 in.; traverse movement of bed, 10 in.; height to spindle centers, 47 in.; floor space, 48x66 in., and weight complete, 2,400 lb. The chuck is driven by a ¼-hp. motor, the internal spindle by a ½-hp. motor, and the face-grinding spindle by a ½-hp. motor.

Sundstrand "Number Three-W" Rigidmil Milling Machine

AMONG the modified types of the "Rigidmil" milling machine, built by the Sundstrand Machine Tool Company, Rockford, Ill., is the "Number Three-W," which incorporates features intended particularly to increase the application of special single- and multiple-spindle heads. The machine is heavier than the standard "Number Three" and has a higher column providing greater flexibility for special heads. It also has a compartment for chips, with a drop door for clean out in the base of the machine. The saddle is of larger proportions, as is the table, and an increased minimum power feed travel is provided. Both the feed control and table stops are protected from chips and coolant.

Two distances from the spindle column to the center of the table are provided on the Number Three-W. The machine having the shorter distance, 12⅝ in., is known as the "Number Three-W-1," and the other, 17½ in., is known as the "Number Three-W-2." Special heads may be mounted on the spindle column for milling on large or cumbersome pieces without sacrificing the table working surface.

Power feed and rapid travel to the table in both longitudinal directions are controlled through a single lever located on the front of the machine. Trip blocks at front of table disengage the feed as well as the rapid travel, which may be set at 102 in. per min. Automatic table control can be provided to return the table to the starting or loading position automatically at the completion of the cut. This automatic control may be operated from either direction by using either right- or left-hand trip blocks.

A one-piece casting embodies the base, column, and saddle. This construction holds the spindle-head and the table in exact relationship. The former is a compact unit mounted on the column with narrow guides for alignment.

A National Standard nose with a

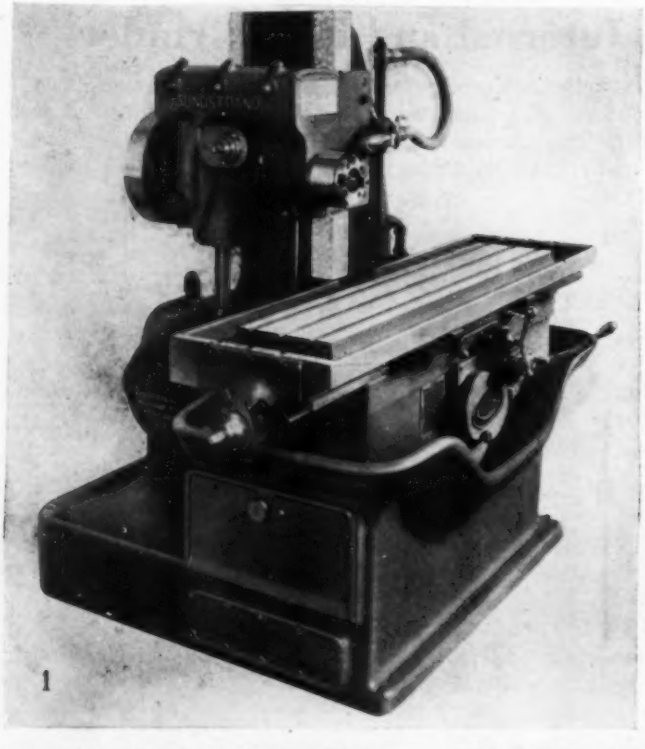


Fig. 1—Sundstrand "Number Three-W" Rigidmil which has been developed especially for the application of special single- and multiple-spindle heads. Fig. 2—For rotary milling jobs a "Number Three-W-2" Rigidmil is set up with a standard vertical head and standard 24-in. rotary table. A flywheel is used on the spindle to effect smooth cutting

hole 2¾ in. in diameter at the large end and a 3½-in. taper per foot are features of the spindle, which is carried in Timken roller bearings, both front and rear. The entire spindle assembly is carried in the steel quill, hardened, ground, and having 3½ in. traverse adjustment. The drive to the spindle is through a coarse-pitch spiral-bevel pinion and gear, the driving pinion and the shaft being in one piece and mounted in Timken roller bearings.

The overarm is a solid steel forging, rectangular in shape. The overarm construction lends itself readily to the application of special cutter heads and other devices.

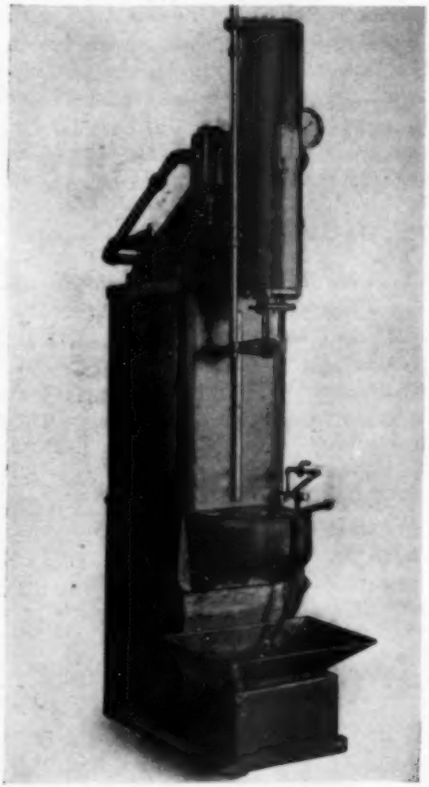
The working surface of the standard table is 16½ in. by 60 in., the table being 32½ in. from the floor. A longer table, 16½ by 72 in., can be supplied. The saddle is exceptionally wide and long, providing solid support for the table. For the standard 34-in. feed table, the saddle is 42 in. long. For the special table having 48-in. feed this is increased to 50 inches.

Drive by belt or motor may be used. When arranged for motor drive, the motor is mounted on an adjustable plate secured to the column at the rear. Two sizes of motors are recommended, depending upon the work to be milled, 5 and 7½ hp., both running at 1,200 r.p.m. The main drive clutch is a sensitive unit of the multiple-disk type and runs in a bath of oil. It is easily adjusted. The feed-box is a compact unit that delivers power feed and rapid travel in either direction to the table, all movements being controlled by a single lever. Like the speed unit, it is easily accessible; all shafts have solid splines; all gears are made of alloy steel, heat-treated, and all parts run in a bath of oil. The spindle speeds range from 17 to 241 r.p.m., and the feeds range from 1.9 to 21.4 in. per min. A vertical spindle head and rotary table are available.

Specifications common to both the Three-W-1 and Three-W-2 machines: vertical adjustment of spindle head, 12½ in.; minimum distance center of spindle to top of table, 3½ in.; maximum distance center of spindle to top of table, 16 in.; horizontal adjustment of spindle, 3½ in., and distance center of spindle to underside of overarm, 7 inches.

American Type V-2, 12-Ton Broaching Press

PUSH broaching, pressing, and assembly and arbor work can be done on the Type V-2, 12-ton broaching press announced by the American Broach & Machine Company, Ann Arbor, Mich. This machine is similar to the 6-ton size manufactured for some time, but has a larger cylinder, longer stroke, and heavier pump. Maximum clearance between the table and the end of the ram is 26 in., and the stroke is of the same length. Work up to 15 in. in diameter can be accommodated, although the table as finished is 12 in. in diameter. Other specifications are: the ram speed of the standard machine is 15 ft. per min.; the lower end of the ram is tapped 2 in., 8 threads per in. to receive standard attachments for pushing and assembly work, and the table has a 3-in. bore.



American Type V-2 12-Ton Hydraulic Broaching Press

Either foot or hand control may be used on this press, which is so arranged that immediately upon the release of either one of these control levers the ram returns immediately to the top or starting position. The ram speed of 15 ft. per min. can be changed to a faster or a slower rate to suit the customer's requirements by a change of the drive pulley diameter. The machine is operated by hydraulic feed from a special geared pump and a balanced piston valve, the pump itself being mounted in the rear of the column.

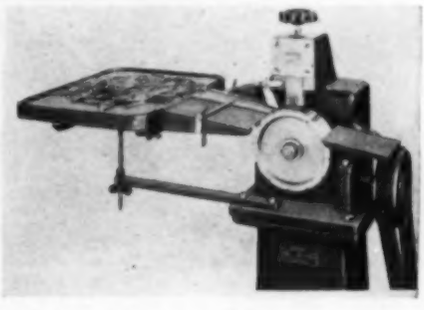
In construction, the machine is very heavy, being of the tie-rod type with a fill-in. frame, making a solid and massive unit. The piston is of solid cast-iron type, and has two step-joint piston rings and one leather cup, making for leak-proof qualities. Support of the ram is furnished by a guide bushing and a packing gland.

Where flexible control is desired, this may be supplied without additional cost. Such an arrangement is suitable for assembly work where any amount of pressure between lower and upper limits can be obtained at will by a slight variation in pressure on the foot pedal.

Floor space required for operation is 4 ft. by 5½ ft., height of work table from floor, 36 in., motor recommended, 15 hp. at 1,800 r.p.m., and weight, 3,900 lbs.

Noble & Westbrook No. 19 Improved Production Marking Machine

Small cylindrical pieces from $\frac{1}{16}$ to ¾ in. in diameter, and from 1 to 4 in. in length may be marked on a production basis on the No. 19, power-



Noble & Westbrook No. 19 Improved Production Marking Machine

operated, rapid-production marking machine announced by the Noble & Westbrook Manufacturing Co., 20 Westbrook St., East Hartford, Conn. The machine is complete with the motor drive.

The machine illustrated is set up for marking roller bearing tie-rods. Straight shank drills, taps, and similar articles are other examples of work that can be marked. A loading platform is provided with an inclined surface to bring the work to the marking dial. A pick-up dial is also provided for small size work, in order to have the work brought straight across the dial. Different size pick-up dials are required and may be changed readily. The larger parts can be marked successfully without a pick-up dial.

The operation of feeding the machine consists merely of keeping the inclined platform filled from the loading platform, the operator sorting out the work, which rolls down the inclined platform by gravity, is picked up by the feeding dial, is passed under the die, and dropped off automatically. A production of 100 to 150 pieces per hour can be obtained with this machine.

Brown & Sharpe Redesigned No. 13B Plain Milling Machine

COMPLETE redesign of the No. 13B plain milling machine has been announced by the Brown & Sharpe Manufacturing Company, Providence, R. I. The feed ranges and the capacity dimensions are nearly the same as those of the previous machine, being as follows: longitudinal feed, 34 in.; transverse adjustment of spindle, 4 in., and vertical adjustment of spindle, 12 in. There are certain improvements, however, to increase the production possibilities.

Compactness of design, rigidity, and power, as well as simplicity of control, are the main features of the redesigned machine. The top of the table is 32 in. above the floor, which is the usual conveyor height, and may thus be found advantageous in reducing fatigue upon work that must be lifted to and from the floor. The position of the driving pulley at right angles to the table permits batteries of these machines to be driven by one line shaft, thus using a minimum floor space.

The bed, table ways, and column are cast in one piece internally braced by webs. The table ways are 42 in. long and support the table for almost its entire length. Cross adjustment for the spindle of about 4 in. is obtained through the 7¼-in. sliding sleeve that carries the spindle and its bearings. The spindle head is massive and can be adjusted without cramping or sagging, because of the method of gibbing. It is clamped rigidly by bolts. Adjustment is made by means of a long movable nut mounted on the stationary screw.

The entire surface of the table is finished, and the feed is by a revolving nut mounted on a large diameter stationary screw. The feed is smooth even under extreme cutting conditions.

The overarms are of the double type. The outer brace can be left attached to the bed of the machine at all times, if desired. Arbor yokes, cutters, and the arbor can be removed without disturbing the outer brace. Rigid trussing of all supporting members and reduction of vibration to a minimum are afforded by means of

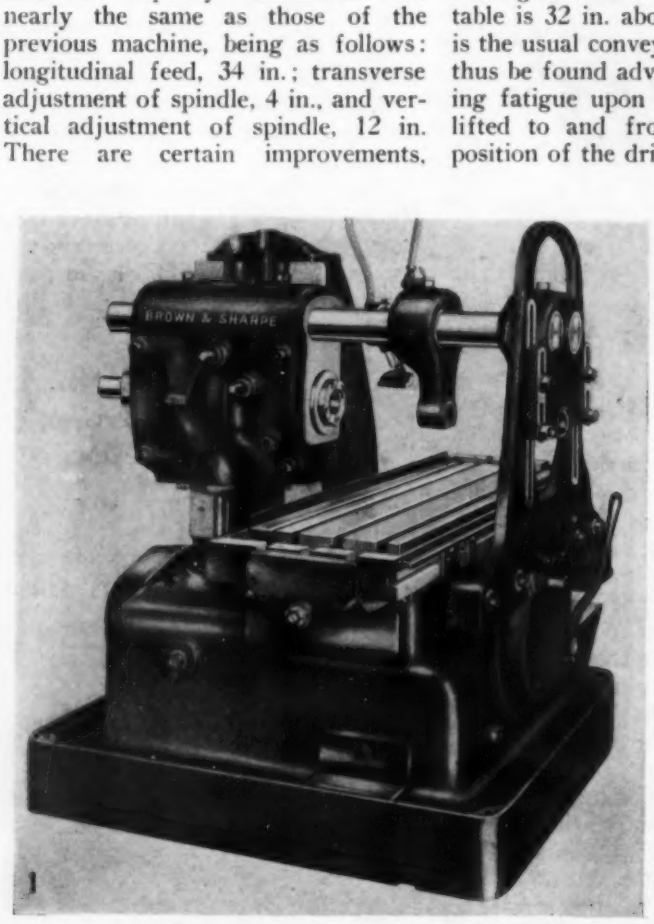


Fig. 1—Left-front view of the Brown & Sharpe Redesigned No. 13B Plain Milling Machine. Fig. 2—Rear view showing that the bed, table ways, and column are integral

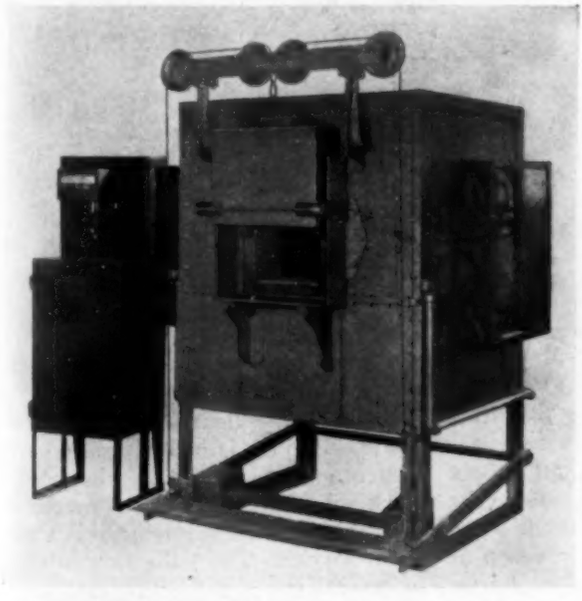
this type of sturdy outer-arm brace.

Power enters the machine through a self-adjusting, multiple, dry-disk clutch. The drive is entirely through splined shafts and gears. Anti-friction bearings are used extensively throughout the machine.

The redesigned No. 13B machine can be operated with entirely automatic table functions when desired, or by means of adjustable dogs a variety of operating cycles can be had. One control lever operates all power movements of the table. This lever is directional and the change from the cutting feed to the power fast travel is obtained by a movement of the lever in a direction at right angles to the table axis.

Bellevue Type TOU High-Temperature Electric Furnace

Various hearth sizes and capacities can be obtained in the high-temperature electric furnace announced by the Bellevue Industrial Furnace Company, 2971 Bellevue Ave., Detroit, Mich. The Type TOU furnace is of the over-and-underfired design, with Globar elements mounted transversely in the top of the heat chamber and underneath the hearth. The latter is made from silicon-carbide, and the special design insures uniformity of temperature throughout the chamber. Convection of heat takes place readily.

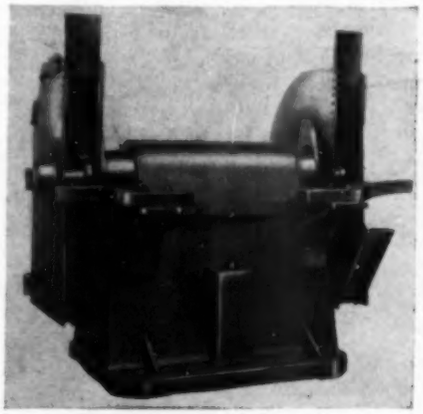


Bellevue Type TOU High-Temperature Electric Furnace, which is suitable for heating flat pieces

This furnace is particularly suited for heating flat pieces where heat penetration from the top to the bottom is preferable to side heat. The unit illustrated has an effective hearth of 12 x 16 in. and a rated capacity of 25 kw. Automatic temperature control instruments are mounted in a dust-proof cabinet.

Ransom No. 124 HS Heavy-Duty Grinder

Designed to use large wheels in order to effect grinding economy, the No. 124 HS heavy-duty grinder is equipped with two 36x3-in. wheels running at 9,500 surface ft. per minute. The machine has been placed on the market by the Ransom Manufacturing Company, Oshkosh, Wis. The



Ransom No. 124 HS Heavy-Duty Grinder

machine is shown without wheels.

The motor is mounted in the base on a platform, which is adjustable up and down by means of the screw shown in the front of the machine. Either a 15- or 20-hp. motor may be used, and it drives the main spindle by means of Texropes. The spindle is 4⅜ in. in diameter and runs in two large S.K.F. ball bearings. Both tool-rest brackets are adjustable up and down to an unusual amount. The machine weighs 5,300 lb. without the wheels.

"B-K" Series 200A Adjustable Toolroom Lap

Three die-cast medium hard alloy inserts are used in the Series 200A toolroom lap announced by the Brickner-Kropf Machine Company, Muskegon, Mich. The tool is so designed that it will lap to the bottom of a blind hole. No springs or delicate parts are employed.

The uniformity of the alloy inserts is held to close limits. These inserts are not recommended for use in holes of larger diameter than $\frac{1}{16}$ over the size marked on the back. The tool is made in sizes from 1 to $\frac{9}{16}$ in., inclusive. It is driven by a floating driver having a straight shank $\frac{7}{16}$ in.

"B-K" Series 200A Toolroom Lap

in diameter, although a special shank can be made to order. Positive adjustment of the wall pressure can be had while in motion, and $\frac{3}{16}$ in. of adjustment is available. The lap should not be operated at excessive speed, not over 175 ft. per minute. Nine inserts are supplied with the tool.

Societé Genevoise Micro-Indicator Tube

The R. Y. Ferner Company, Investment Building, Washington, D. C., agent for Societé Genevoise D'Instruments De Physique, Geneva, Switzerland, is placing on the market a micro-indicator tube for use with the various types of supports supplied for the accurate checking of parts by comparison with standard gages or

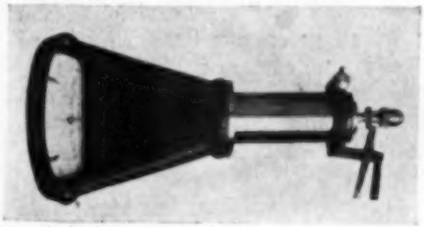


Fig. 1 — Societé Genevoise Micro-Indicator Tube, which is used for the accurate checking of parts by comparison with standard gages or gage blocks

gage blocks. This tube, shown in Fig. 1, has a fan-shaped dial that gives a range 2½ times that of the cylindrical indicator previously supplied.

A feature of the knife-edge multiplication system used in this tube is a yoke at the upper end of the contact plunger that passes about the fixed knife edge. This yoke carries the movable knife-edge with the edge pointed downward and bearing against the rocking plate lying between the two knife edges. This construction is shown in Fig. 2. The rocking plate carries the pointer and is pulled against the upper, movable, knife edge by a helical spring. When the contact plunger is raised, the rocking plate follows the moving knife

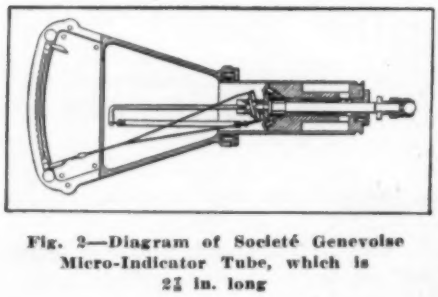


Fig. 2—Diagram of Societé Genevoise Micro-Indicator Tube, which is 2⅞ in. long

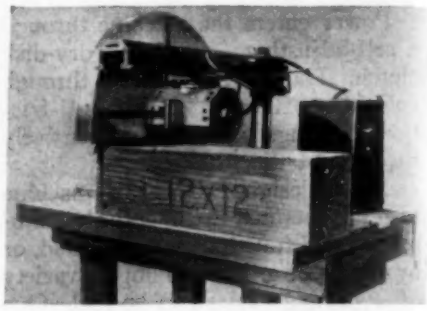
edge only as far as the range of movement of the pointer permits, beyond which the knife edge can move and give a total travel of the anvil of 0.03 inch. Ample room is furnished by this additional travel for inserting the work piece under the anvil without injuring the latter by rolling or sliding friction. A pair of levers is provided for attachment about the bottom of the tube to raise the anvil in this manner.

With the knife-edge multiplication system adjusted to a 400:1 ratio, two scales are used, one having 60 divisions, each representing 0.0001 inch, or a total range of 0.006 inch, and the other scale having 30 divisions twice as wide as the above. With a multiplication of 120:1, a third scale is provided having 40 divisions, each of which represents 0.0005 inch and gives a total range of 0.02 inch. Two tolerance indexes, colored red, are adjustably mounted in a slot above the dial. Various types of anvils can be supplied.

The micro-indicator has an outside diameter of approximately 1.181 in., and a total length, including the space required for the lifting levers, of 2⅞ inches.

DeWalt Heavy-Duty Timber Cutter

For shops using heavy timbers for shoring purposes and the shipment of heavy machinery, the heavy-duty cutting equipment illustrated has been developed. It has been placed on the market by the DeWalt Products Corporation, Leola, Lancaster County, Pa. Heavy timbers can be handled with ease by one man feeding the saw through the material by means of a hand ratchet gear feed or by chain feed on the arm of the machine. This arm may be raised or lowered to the depth of the cut. Saw blades up to 36 in. are provided to handle 12x20 in. material, or a 16-in. dado head may be used to dado to 3 in. The saw blade operates at 1,750 r.p.m. and is driven direct by a motor operating on either 2- or 3-phase, 220 or 550-volt circuits.



DeWalt Heavy-Duty Cutter for 12 x 12-in. timbers

Two models are supplied in this heavy-duty cutting equipment, the model L and the model T. The capacity of the first is 12x12 in., while that of the second is 12x20 in. The model T is mounted on an all-metal table, equipped with steel conveyor rollers for easy handling of heavy material. The elevating device is operated by a wheel in front of the table.

South Bend 9-Inch Precision Lathe

LIKE the previous lighter models of South Bend 9-in. lathes, this 9-in. machine is a back-geared, screw-cutting precision tool. Its design, however, makes it a distinctly different machine. The principal improvement is a headstock of the same style and design as was adopted on the large size toolroom lathe described on page 217, Vol. 71, of the *American Machinist*. The tool has been placed on the market by the South Bend Lathe Works, South Bend, Indiana.

The improved headstock has a three-step cone which permits more power to be transmitted to the spindle, according to the manufacturer. By means of improved gear guards the headstock casting has been strengthened and braced in a manner similar to the 16-in. toolroom lathe.

Another change is the provision of a backgear-shaft oiling system. Easier and better oiling of the spindle bearings is also a feature, and the spindle carries a seal that prevents the accumulation of oil on the outside of the headstock. The gear guards, which strengthen the headstock casting, and the means provided for securing the headstock to the lathe bed insure permanence of alignment of the headstock spindle, and adapt the machine to precision manufacturing and toolroom service. The lathe is available in several styles and sizes, and with countershaft or motor drive to suit the customer's requirements.

South Bend Improved 9-Inch Lathe

"Etteo" Portable Drill Chuck

A hand-operated drill chuck suitable for use with portable electric or air drills has been developed by the Eastern Tube & Tool Company, 594 Johnson Ave., Brooklyn, N. Y. No key, collar, nor spindle locks are necessary, hand operation sufficing.

As shown in Fig. 1, the nose is bored to receive three jaws. The nose is fastened to an internally threaded sleeve. A thrust assembly, to which the jaws are attached, screws up or down with the threaded sleeve. The above parts, or body of the chuck, are mounted on and revolve around a driver, shown in Fig. 2, which attaches to the electric drill spindle or an arbor. The square section of the driver fits very loosely onto the thrust screw. Turning the body of the chuck about the driver and screw causes the thrust assembly to travel up or down, and the jaws to open or close.

As long as the jaws barely touch the drill, it will tighten itself automatically in accordance with the load applied. There is a floating action between the parts, so that there is no binding or wedging within the chuck. When using the chuck, the square portion of the driver drives the screw, which, in turn, tightens the jaws. As the jaws grip harder, the tightening action of the screw prevents it from being released easily. After gripping, the body of the chuck and the screw can be oscillated about the driver, within the limits of the square stops. When the chuck is suddenly rotated opposite to the way it is driving, a knock or blow is imparted, causing the screw to release its binding friction on the threaded sleeve. The chuck will not loosen by itself.

The outer parts of the chuck are made from 0.40 carbon, high-manganese steel and the inner parts from 0.20 carbon high-manganese steel, carbonized, heat-treated, and ground. The jaws are of a special oil-hardening alloy steel.

The chuck is made in four sizes for $\frac{1}{4}$ to $\frac{1}{2}$-in. drills, the sizes being $\frac{1}{4}$, $\frac{5}{16}$, $\frac{3}{8}$, and $\frac{1}{2}$ inch.

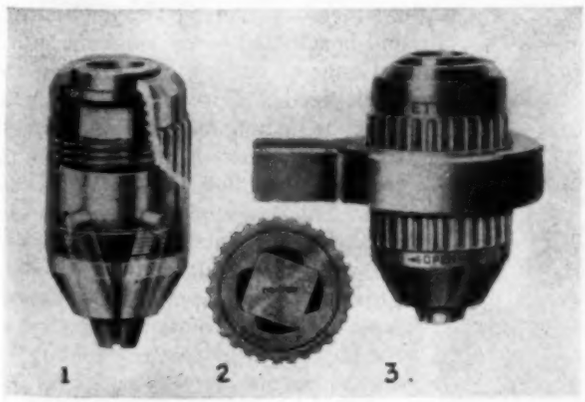


Fig. 1—"Etteo" Hand-Operated Portable Drill Chuck for portable drills. Fig. 2—A square driver is employed. Fig. 3—Taking the chuck apart is facilitated by the special box wrench illustrated

EQUIPMENT ADAPTATIONS

Recently Developed by the Makers

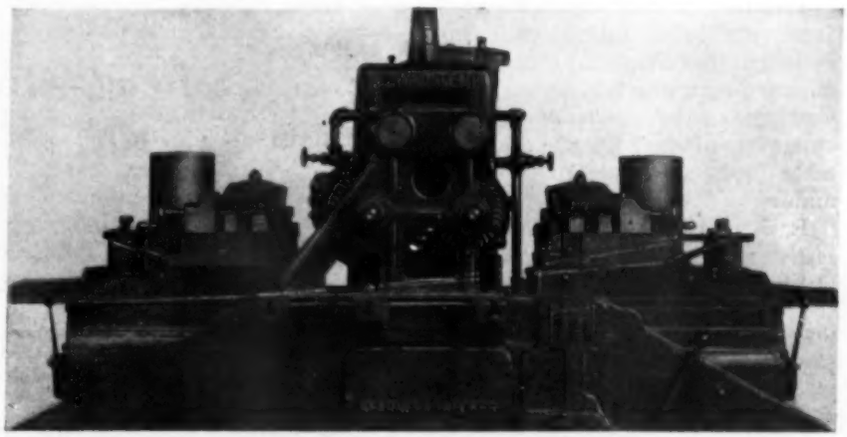
Double-Spindle Head and Independent Tables for the "Mil-Waukee-Mil"

Rough and finish milling the bosses on automobile steering spindles is done on the No. 1404 "Mil-waukee-Mil Simplex," equipped with a special two-spindle head and two special cam-operated reciprocating tables. The steering spindles are alloy steel forgings. Two of them are held in each of the two fixtures, one fixture being placed on each table. Two gangs of H.S.S. spiral half-side mills are employed.

The special two-spindle head is designed so that the spindles rotate in opposite directions, imposing the cutter thrust down on the table. Two reciprocating tables are operated by drum cams designed to carry the work rapidly up to the cut, slow down with a variable feed while in the cut, and return rapidly to the starting position when the cut is finished. The tables operate independently of each other.

The cycle of operation for one table is as follows: Two steering spindles are placed in the fixture and the operator engages the feed lever. Next, the table quickly advances the work to the cutters and during the travel trips an air lever to clamp the workpieces. The drum cam controls the feed so that the work slows down as the cutters approach the heavy cut at the bottom of the piece. When the cut is completed, the table returns rapidly to the starting position, tripping the air lever and releasing the clamps on the return stroke so that the work may be removed.

The fixture is designed so the clamping can be done manually if preferred. The tables can be set to reciprocate or stop at the back of each stroke.



From 300 to 330 automobile steering spindles can be rough and finish milled on the Kearney & Trecker No. 1404 "Mil-Waukee-Mil Simplex" equipped with a special two-spindle head and two special cam-operated reciprocating tables

Three-Spindle Fixture for Milling Teeth in Oil-Well Drillhead Cutters

An application of a standard milling machine for milling teeth in steel cutters for oil-well drillheads is that of a standard No. 5-48 plain "Hydromatic," made by the Cincinnati Milling Machine Company, Cincinnati, Ohio, with a one-way table feed cycle. It is equipped with a special fixture and carries six form cutters.

With this arrangement eight cutters are mounted on each of the three mandrels. A special, three-spindle, hand indexing fixture holds these mandrels between centers. A feature of the fixture is the automatic means for tightening the driving keys of each spindle. Cam-operated clamps are also provided for clamping the spindles solidly.

Two teeth in each cutter are milled from the solid during each work cycle by the six 6-in. form cutters mounted on a standard No. 2-B, 30-5 Cincinnati arbor. On this job the cutter speed is 53 r.p.m., and the table feeds at a rate of 10-in. per minute.

Each drillhead cutter requires 24 teeth and since two teeth are milled during each cycle, 12 indexings of the fixture are made. Indexing is effected by turning the hand lever on the fixture, which transmits this motion through two change gears having 35 and 42 teeth, respectively. In turn, a shaft is driven on which three worms are mounted and meshed with worm wheels on the spindle. One revolution of the index handle gives one-sixth of a turn of the work. One-half turn gives one-twelfth of a revolution of work, which is the amount required when indexing from one cutting position to another

Twenty-four cutters, eight to a mandrel, may be set up and milled in the special three-spindle, hand-operated fixture mounted on a Cincinnati "Hydromatic" No. 5-48 Milling Machine

Foster Special Crank Turning Machine

Center drive is used on the special crank turning machine built for a tractor manufacturer by the Foster Machine Company, Elkhart, Ind. Two arms of a large crankshaft are turned at the same time and while the turning operations are in process, the outside surfaces of the cheeks are faced, together with several shoulders and ends. In Fig. 1 a view of the machine itself is shown, while in Fig. 2 is a close-up of the tooling.

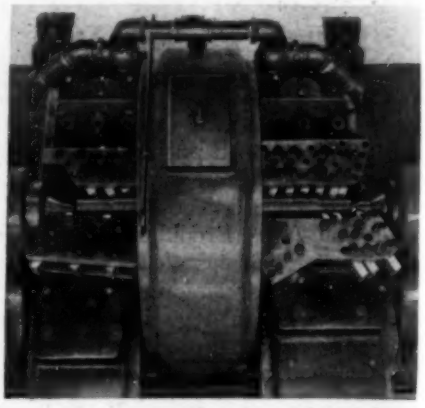


Fig. 2—Close-up of the tooling which completes all operations simultaneously

The crankshaft is supported on four centers, two of which are carried in the central driving member and are equalizing. The centers carried in the tailstock are supported by Timken roller bearings. The driving member rotates on roller bearings and is actuated by herringbone gears.

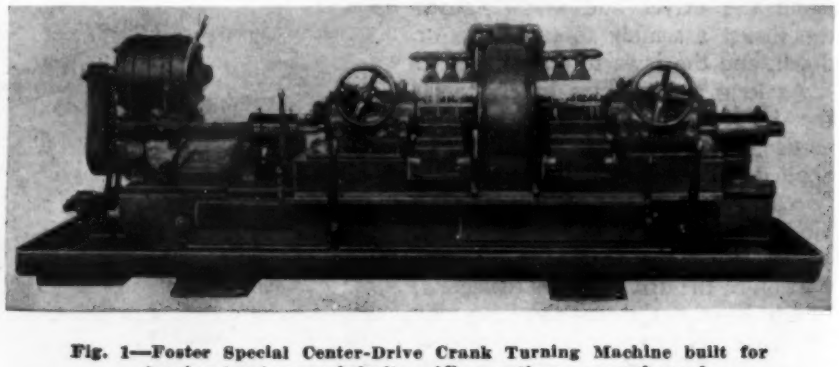


Fig. 1—Foster Special Center-Drive Crank Turning Machine built for turning tractor crankshafts. All operations are performed in about six minutes

Gangs of cutters at the rear of the work feed longitudinally and complete the turning operations. Through the action of cams the cutter gangs in the front side of the work are cross fed to complete the operations of facing the outside of the throws, and also the operations of facing the ends and shoulders. All operations are completed simultaneously, and at completion, the entire tooling is backed to the starting position. All feeds are hydraulically operated.

The crank arms are 12 in. long and 3¼ in. in diameter. They are rough turned in six minutes.

Drilling Cotter Pin Holes in Cooke Brake Pins

The machine illustrated in Fig. 1 has been developed by the Kingsbury Machine Tool Corporation, Keene, N. H., to drill automatically the cotter pin holes in Cooke pins, which are used especially on railroads.

Three holes must be drilled as shown in the sectional view, Fig. 2, so that a cotter pin driven into the hole *A* will spread automatically when striking the sharp edge formed by the intersection of the holes *B* and *C*. A small ledge or shoulder is left at the bottom of the holes *B* and *C* so that a cotter pin cannot be driven through either of these holes.

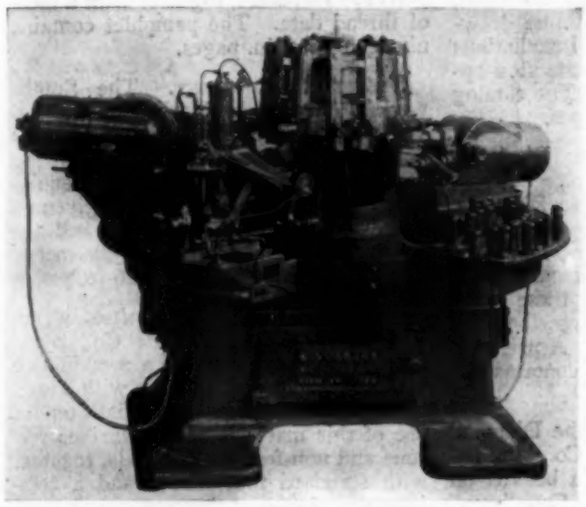


Fig. 1—Kingsbury Three-Head Automatic Drilling Machine, which is designed for drilling cotter pin holes in Cooke brake pins

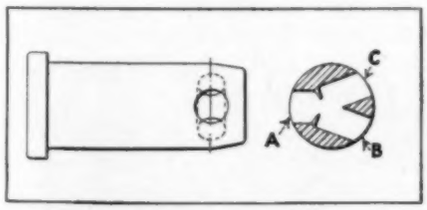


Fig. 2—The Cooke pin

The drilling machine, built up from standard Kingsbury units, consists primarily of an automatically indexed turret and three No. 30 automatic drilling heads. The loading station of the turret is shown in Fig. 1, the turret indexing to the left. At the first station to the left beyond the loading position, hole *A* is drilled by a head that has a spindle extension passing through the turret base, the hole being drilled from the inside of the turret. In order to clear the pins on the side of the turret nearest this head, the spindle extension and head are placed at angle of 5 deg. with the machine table. The pins are therefore placed in the turret on a 5-deg. angle with the turret axis.

The Cooke pins are clamped in V blocks by means of a screw. In addition, an external clamp lever is placed to perform the double duty of taking the thrust of the drilling head as well as locking the turret in position.

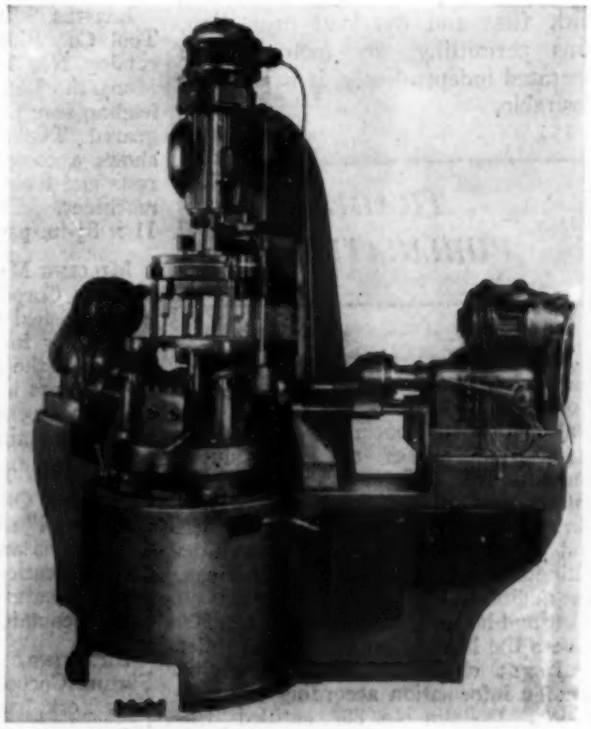
At the subsequent working stations, the holes *B* and *C* are drilled by two heads located in the proper position on the machine table. These heads are mounted on angular adapter plates so that all three drilled holes will be in the same plane, square with the axis of the pin. As the converging point of the center lines of the holes *B* and *C* will vary with respect to the turret center when drilling different diameter pins, these two adapter plates are adjustable on the machine table.

Each turret station consists of a fixed V block in the lower position and two V-blocks adjusted vertically to gage the pins from under the head. These adjustable V-blocks slide in vertical ways and are carried on two threaded studs. Small pinions are placed on the upper end of these studs and adjustment of the V-blocks is obtained by meshing a piloted gear with the pinions. The machine illustrated in Fig. 1 will take pins from 1 to 2½ in. in diameter and 2½ to 12 in. long. Automatic indexing of the turret is obtained by means of a Geneva mechanism.

Synchronization of the turret index, lever clamp, and spindle stroke is obtained by the use of compressed air through a series of regulating valves. This construction permits the operator to run the machine as a full or semi-automatic type. When running in the semi-automatic condition, the turret will not index until the operator trips the control valve. On the other hand, when running full automatic the operator leaves the control valve in the "on" position, thus permitting the turret to index automatically as soon as all the spindles on the machine have completed their strokes and returned to their starting positions.

Drilling and Reaming Valve Tappet Guides on a Three-Head Machine

Four holes are drilled and rough reamed and four others are drilled on the three-head drilling and reaming machine developed by the Bradford Machine Tool Company, 657-671 Evans St., Cincinnati, Ohio. Four



Floor-to floor time of 53 seconds is obtained on a Bradford Three-Way Drilling and Reaming Machine on valve tappet guides having eight holes. Four of the holes are rough reamed

holes are drilled and rough reamed to 0.613 in. in diameter by $1\frac{1}{16}$ in. long; two others are drilled $\frac{29}{64}$ in., and the last two, $\frac{19}{64}$ in. The valve tappet guides are of cast iron. A cutting speed of 85 in. per min. is employed with a feed of 0.009 in. per revolution of the spindle.

Station No. 1 at the front of the machine is employed for loading and unloading the fixture. Station No. 2 at the operator's left hand is for drilling four $\frac{33}{64}$ in. holes, $1\frac{5}{16}$ in. deep from the horizontal and drilling two $\frac{29}{64}$-in. holes from the vertical. Station No. 3 at the operator's right hand is for rough reaming four 0.613-in. holes from the horizontal and drilling two $\frac{19}{64}$-in. holes from the vertical. After loading the fixture, the work is indexed by hand progressively through the two working stations, producing one part at each cycle of the machine. A small hand valve mounted at the front of the machine connects the air trip cylinders attached to the trip levers of all the heads, and causes all spindles to advance simultaneously to perform their respective operations, after which they return to the starting point and stop. A push-button switch controls the main line circuit, and each motor has an independent switch with fuse and overload protection, thus permitting any motor to be operated independently, if it is found desirable.

TRADE PUBLICATIONS

BALL AND ROLLER BEARINGS. S. K. F. Industries, Inc., 40 East 34th St., New York, N. Y., has recently released several publications concerning some of the engineering phases of its products. Bulletin No. 205 covers engineering data sheets giving load ratings and dimensions for radial, angular contact and thrust ball bearings, as well as cylindrical and spherical roller bearings. In addition, there is information on shaft and housing fits. Bulletin No. 206 covers the lubrication of ball and roller bearings; charts are included giving specific information according to application. Bulletin No. 207, entitled "Engineering & Design," presents a summary of anti-friction bearing applications brought up to date. Much space is given to the design of ball and roller bearings.

BORING MACHINES. The Universal Boring Machine Co., Hudson, Mass., has published a folder on its No. 44 "Tri-way" boring machine, giving the special features and specifications. The catalog contains six 11 x 8½-in. pages.

DRILLING MACHINES, RADIAL. The Western Machine Tool Works, Holland, Mich., has published Catalog No. 40, covering its heavy-duty "Low Hung Drive" Timken bearing equipped radial drilling machines. Various constructional features are thoroughly described, and illustrated by means of line drawings and photographs. Installations used on various types of production operations are also included. The catalog contains 23, 11 x 8½-in. pages.

ELECTRIC TOOLS. The Black & Decker Manufacturing Co., Towson, Md., has published catalog No. 20 on the various electric tools of its manufacture. These include drills, sanders, hammers, grinders, and various attachments, parts, and materials for use with these tools. Each article is thoroughly described and the specifications are listed. A price list is included. The catalog contains 39, 11 x 8½-in. pages.

FLEXIBLE COUPLINGS. The Diamond Chain & Manufacturing Co., Indianapolis, Ind., has published a booklet on "Diamond-Clark Flexible Couplings," showing the construction of and giving the uses for this roller-chain type flexible coupling. The pamphlet contains sixteen 9x6-in. illustrated pages.

LATHES. The Monarch Machine Tool Co., Sidney, Ohio, has published catalog No. 131 entitled "Features of Monarch Lathes." It describes the leading features of the Monarch helical-geared Timkenized lathes, and also shows a complete line of turrets, toolrests and toolroom accessories for these machines. The catalog contains 44, 11 x 8½-in. pages.

MILLING MACHINES. The Kearney & Trecker Corporation, Milwaukee, Wis., has published a booklet entitled, "Milling Faster for Tractor Power," which illustrates the many different set-ups of its machines in the production of tractor cylinder blocks and other parts. The bulletin contains 33, 11 x 8½-in. pages.

SHAPERS. The Cincinnati Shaper Co., Cincinnati, Ohio, has published General Catalog "N" showing 22 shapers. Short descriptions are given of each type and the specifications are listed. Various important features are illustrated. The catalog contains 27, 11 x 8½-in. pages.

SHELVING, STEEL. The Universal Fixture Corporation, 135 West 23rd St., New York, has published a folder showing various types of steel shelving and steel cabinets.

SAW SHARPENERS. Samuel C. Rogers & Co., 191 Dutton Ave., Buffalo, N. Y., have published a leaflet describing their No. 4 automatic saw sharpener for metal-cutting saws from 3 to 30 in. in diameter. This machine can also be used for woodworking saws.

SCREW THREAD, DARDELET. The Dardelet Threadlock Corporation, 120 Broadway, New York, has published a booklet, entitled "Dardelet, The Self-Locking Screw Thread," which describes this thread and its properties of resistance to vibration. Many illustrations are furnished, together with a table of thread data. The pamphlet contains nineteen 9 x 6-in. pages.

TESTING EQUIPMENT. The Southwark Foundry & Machine Co., 400 Washington Ave., Philadelphia, Pa., has published a loose-leaf catalog showing the various types of its testing equipment. Considerable material is given on the design of these machines and the specifications and erection requirements. The catalog contains 62, 9 x 6-in. pages.

TUNGSTEN-CARBIDE, TURNING WITH. The Porter-Cable Machine Co., Syracuse, N. Y., has published a combination booklet-catalog on "Turning with Tungsten Carbide," which gives data on the use of this material on the various ferrous and non-ferrous materials, together with standard tool shapes and a complete description of the parts, assemblies, and tooling for the "Carbo-Lathe." Specifications of the machine are listed. The catalog contains 31, 11 x 8½-in. pages.

A.S.M.E. TECHNICAL COMMITTEES REPORT. The American Society of Mechanical Engineers, 29 West 39th St., New York, N. Y., has published a reprint of the annual reports of the A.S.M.E. Research, Standards, Safety, Power Test Codes, and Boiler Code Committees for 1928-1929, in pamphlet form for convenient reference.

FILES, SAWS, AND HARDWARE. The U. S. Department of Commerce, Bureau of the Census, has published under the Census of Manufacturers for 1927 a booklet on "Cutlery, not including silver and plated cutlery, and edge tools, files, saws, and hardware, not elsewhere classified." Among the statistics given are the values produced of files and saws and some unclassified hardware for use in the metal-working industry. The bulletin may be obtained from the U. S. Government Printing Office, Washington, D. C., for five cents.

NEW ENGLAND COUNCIL REPORT. The New England Council, Statler Building, Boston, Mass., has published its annual report for 1929, entitled "A United New England: Four Years of Progress," which cites the economic progress in New England during the time of the Council operation. The pamphlet contains 48, 11 x 8½-in. pages.

NEWS
OF THE WEEK

Well-attended Sessions Mark Annual S.A.E. Meeting

By Herbert Chase

Associate Editor, American Machinist

NUMEROUS well-attended sessions marked the annual meeting of the Society of Automotive Engineers in Detroit last week. No startling innovations in engineering practice came to light at the meeting, but there was a general feeling that the intense competition which the automotive industry faces this year is likely to result in more radical changes in mechanical design than have occurred for several years past. This is because the "styling" process," which has been getting the lion's share of attention in recent years, has been followed so intensively by nearly all companies that it no longer yields a sufficient sales advantage. Alfred Reeves, general manager of the National Automobile Chamber of Commerce, gave expression to this view in his address before the society and indicated that the industry is looking to its engineers for improvements displaying greater originality than has been evident in recent years. There is too great a number of models and too much similarity between cars of different makes. Prices also are too low, in Mr. Reeves' estimation.

Dean Dexter S. Kimball of the College of Engineering, Cornell University, speaking before the first production session of the meeting, made it plain that in the future, intelligent production planning, or the "economics" of production, of necessity, will be done by the engineer and economist, for the reason that only trained thinkers with adequate knowledge of applied mathematics can evaluate properly the numerous factors making for success or failure in production work.

At the foundry economics and production session, the paper by Donald Campbell, of Campbell, Wyant & Cannon, stressed the advantages of greater use of green sand in cylinder-block casting. In some Pontiac cylinder work the weight of dry sand cores has been reduced by 150 lb. Chevrolet engineers questioned whether the saving on this score, amounting to 91 cents per casting for some castings, will result in much net gain when increased machining difficulties are considered. Chevrolet practice, however, has reduced dry sand core weight about 25 per cent within the last five years.

In his comments upon the use of tungsten-carbide tools, A. K. Brumbaugh of the White Motor Co. pointed out that the saving in time in machining iron castings is far less than the saving in chip and other scrap which can be realized because less allowance need be made for machining. Discussion brought out the fact that the greatest gains from the use of tungsten-carbide tools have resulted in operations on non-ferrous metals, molded products, and cast iron. Machine tools designed for light cuts at very high speed and giving extreme rigidity are essential for maximum output with tungsten carbide.

Great interest has been shown in the metal-clad lighter-than-air craft development described in Ralph Upson's paper on this subject. The chief disadvantage is higher cost, and this is offset by numerous advantages. Much larger ships than the one now in use by the Navy Department are contemplated and will be built if purchasers are found.

Committee reports indicate that the membership of the Society increased from 6,921 to 7,227 during the year 1929. The research committee has made substantial progress in its work on fuels, headlighting, riding qualities, and wheel alignment. New society sections have been organized in Wichita, Kan.; St. Louis, Mo.; and Pittsburgh, Pa. During the past year the Standards Committee adopted 42 new specifications, revised 27, and cancelled fourteen. Eleven meetings of national scope were held. It is understood that the nominating committee has named a slate of officers for 1931, but will not report until the summer meeting to be held June 25 to 29, at French Lick Springs, Indiana.

* * * *

Motor Boat Builders Follow Auto Trend, Standardizing and Modernizing

INCREASING comfort and decreasing cost were the features of the varied motor boats on exhibition at the 25th annual Motor Boat Show of the National Association of Engine & Boat Manufacturers, at the Grand Central Palace, New York, last week. Manufacturers seem to have striven to attain boats which are trim, speedy, and susceptible to quantity production, and are suitable also to use in extended cruising and to serve as vacation homes for their owners. And the attendance at the Show seems to justify this attitude on the part of the builders, for all records of attendance at this annual affair were broken, 200,000 people having looked over the four floors of exhibits by Thursday night.

Monel Metal, Everdur, Tobin bronze, and similar metals are finding increasing use in the better boats, Monel metal for shafts and undersea fittings, Everdur for bolts, rivets, and nails, and Tobin bronze for bearings. There is a goodly amount of nickel silver and nickel steel in evidence also, as well as the conventional marine metals, brass, bronze, and copper. Many of these pieces are die castings.

Diesel powerplants also received their share of attention. Several boats equipped with Diesel engines were shown, and unmounted motors of this type were on exhibition of a size for application on smaller boats, all of them completely enclosed and neat in appearance. Various kinds of muffles and vibration reducing devices were also in evidence.

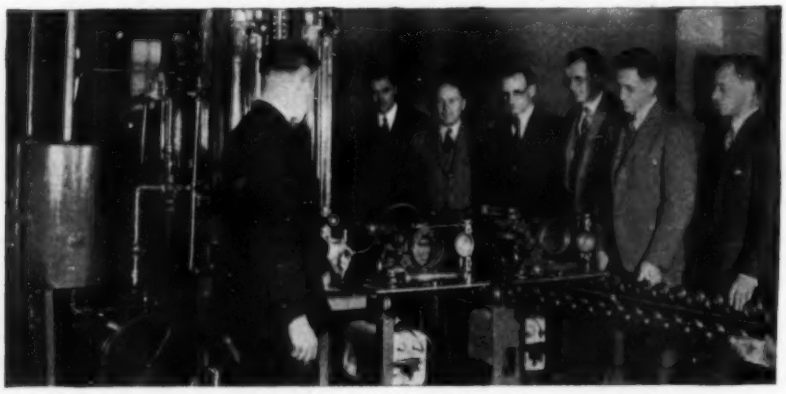
One 16-ft. runabout, with quality and luxury of many times more expensive craft, is being sold for $945 complete—the result of a move similar to that of many automobile manufacturers to popularize the craft. The boat is salt-water equipped throughout, having all mahogany planking, double-planked bottom, brass and bronze fastenings, manganese bronze strut and rudder, plastic bronze stuffing box, Monel metal shafts, solid nickel-silver deck fittings, a nickel-silver figurehead, and an excellent finishing job. All parts are standard and interchangeable, and can be produced in quantity.

Another development is increased cruising range. Practically all boats claim increased fuel capacity, greater speed, and greater economy, to make them worth consideration as a means of commuting during the summer, as well as being a completely equipped summer home for from four to six people. Complete galley facilities, separate crew's quarters, pullman berths, and dozens of other homey aids are now incorporated, and driving aids are as complete as those

on a fine motor car, fingertip controls and illuminated dashes being ordinary equipment nowadays.

There is still a wide field for the adoption of production methods in motor-boat manufacture, largely because of the nature of the market—purchasers of previous years being of the class wishing an individual job, and willing to pay for it. The newer class of buyer, the class in attendance at the Show, were largely of the type who buy medium-priced automobiles, the people who want a boat for service and enjoyment, and are willing to have a standardized model for which they pay less. One of the papers introduced at the technical meeting of the motor-boat division of the S.A.E. stressed this point also, advocating that individual builders plan production of parts as a group, doing individual assembly. These are but straws, but they show the direction of the wind.

Charging the First Westinghouse Refrigerator Unit



Westinghouse officials watching the process at the Mansfield, Ohio, plant. In the picture are, left to right: J. F. O'Donnell, sales supervisor; E. M. Olin, works manager; I. F. Baker, European sales manager; E. L. Spray, works engineers; Ralph Gates, manager sales promotion; and M. C. Terry, manager, refrigeration engineering, designer of the unit. J. L. Zimmerman, works engineering department, is turning the valve.

* * * *

Round-Table Talks and Shop Courses to Feature 1930 A.F.A. Convention

GREATER interest shown by an increasing attendance at the round-table meetings and shop-operation courses which formed a part of the past few conventions of the American Foundrymen's Association has led the Program Committee to broaden the scope of these sessions for the 1930 annual meeting. The program for this year's convention, scheduled for the week of May 12 at Cleveland, provides for three round-table luncheon meetings, covering malleable, steel, and non-ferrous foundry practice.

Chairmen selected to lead these meetings are leaders in their respective branches of the industry. H. M. St. John, metallurgist for the Detroit Lubricator Co., Detroit, will preside at the non-ferrous meeting; W. J. Corbett, Fort Pitt Steel Castings Co., McKeesport, Pa., will lead the steel group, and P. C. DeBruyne, Moline Malleable Iron Co., St. Charles, Ill., will act as chairman for the malleable group.

No specially prepared papers will be presented at these informal luncheon meetings, but every one present will be given an opportunity to propose and to discuss any phase of management, metallurgical, or shop practice.

Three shop-operation courses, organized expressly for the practical shop man, are scheduled. These will cover steel foundry operation, gray-iron foundry operation, and non-ferrous foundry practice. Each course will consist of a series of three or four sessions, the leaders for each session being assigned a definite subject for discussion.

Thus, W. F. Graham of the technical division, Ohio Brass Co., Mansfield, Ohio, is in charge of organizing the course for the non-ferrous foundrymen. The subjects which will be discussed at this course include crucible, open-fire, and electric furnace practice.

D. E. Broggi, foundry superintendent and metallurgist, Neptune Meter Co., Long Island City, N. Y., will lead the discussion on the indirect-arc-type furnace, and C. H. Morken, plant metallurgist, Ohio Brass Co., Mansfield, Ohio, will lead the discussion on the induction-type furnace.

The steel foundry course is being organized by a committee consisting of John Howe Hall, Taylor-Wharton Iron & Steel Co., High Bridge, N. J.; F. J. Stanley, works manager, Michigan Steel Castings Co., Detroit, and C. D. Carey, works manager, American Steel Foundries, Verona, Pa. Sessions outlined for the steel course will cover chipping, grinding, and riser removal; heat treating and heat-treating equipment, and core practice—including anchoring, rodding, venting, and sand mixtures.

Four sessions will comprise the gray-iron shop-operation course. The first session will cover cupola materials and will be under the direction of C. J. Scullin, of Tucker-Scullin, Inc., St. Louis. Mr. Scullin will be assisted by E. J. Lowry, consulting metallurgist.

Cupola materials and operation will be discussed at the second session, under leadership of R. S. MacPherran, chief chemist, Allis-Chalmers Mfg. Co., Milwaukee. He will be assisted by F. J. Walls, metallurgist, Wilson Foundry & Machine Co., Pontiac, Mich., and by James T. MacKenzie, metallurgist, American Cast Iron Pipe Co., Birmingham, Alabama.

The third session will be devoted to a discussion of gating and risering, and will be led by H. W. Dietert, foundry engineer, U. S. Radiator Corp., Detroit.

Those attending the fourth session will deal with high-test irons, alloy additions and heat treatment of cast iron. Leading this session will be H. Bornstein, metallurgist, Deere & Company, Moline, Ill., who will be assisted by F. B. Coyle, research metallurgist, International Nickel Co., New York.

* * *

A.S.S.T. Soon to Hold Semi-Annual Meeting

New York City will be the scene of the semi-annual meeting of the American Society for Steel Treating on Feb. 7-8. The sessions will be held at the Hotel Pennsylvania on Friday morning and afternoon, Feb. 7, and Saturday morning, Feb. 8. The program to be offered covers an exceptionally diversified list of subjects, among them "Nickel Alloy Steel Forgings," "Manganese Structural Steels with Chromium Additions," "Grain Structure of Martensite," "Annealing or Softening of Nitrided Steels," "Transformation and Constitution of High-Chromium Steels," "Recent Developments in Normalizing Sheet Steel," "Notes on Sheet Metal and Strip Steel for Automobile Bodies," and "Metals for Vitreous Enameling."

* * *

Stanley Electric Tool Takes Over Sales Work

The Stanley Electric Tool Co., subsidiary of the Stanley Works, New Britain, Conn., has been formed to handle sales of products of the Stanley Works and associated companies. The personnel of the new company is: L. M. Knouse, president; Cedric Powers, vice-president in charge of production; H. W. Blackman, secretary; L. W. Young, treasurer; and R. W. Chamberlain, sales manager. Sales and service stations will be installed at New Britain, Conn., New York, Philadelphia, Cincinnati, Detroit, and Chicago. The Stanley Electric Tool Co. has taken over the sale of tools previously handled by the Stanley Rule & Level Plant for all districts except the Pacific Coast and the South.

New and Old Ideas Conflict In the Industries of France

By Our Paris Correspondent

THE French industrial situation sees itself mirrored in New Year resolutions. The last year's profit-taking has not been in just relation to the industrial activity; for the future, the situation is hardly more hopeful, without sensible price reduction or a larger purchasing power on the part of the French consumer.

The end of the year brought much discussion of the economic status of the country, and the unfavorable factors therein. Certainly, French exports of manufactured goods suffered during the year, dropping off considerably from two years ago, and there is no assurance that matters will improve in the immediate future.

The purchasing capacity of the French for other than living necessities may not have reached saturation, and the automobile, above all motor trucks and omnibus chassis and bodies, still has a potential heyday before it, if prices can be reduced on the home-made product to meet those of half a dozen well-known American makes which are actually selling here in larger volume than ever before. The latter are heavily taxed with customs and luxury charges. The situation is anomalous in that it has been brought about on one hand by the government's desire for revenue from this source and on the other by the local industry's demand for protection, in just what proportions respectively it is difficult to say.

The foreign market has not returned the results which were expected under the notable spurt which was recorded in 1927. Machinery and tools, automobiles, and most manufactures of metal have fallen off in this direction, while imports are creeping up on the protectionist shores of France as the ocean tides.

The United States has a billion francs in surplus value for the first ten months of the year, as compared with a like period last year; Great Britain, four hundred million; Germany, nearly a billion and a half. Exports to the United States have remained stationary, have fallen off nearly a billion to Germany, and four hundred million to Great Britain. Total imports show an increase of 5 billion francs and exports a drop of 2 billion francs, together a red ink balance of 7 billion francs, or approximately $280,000,000. This is about the cost of the Panama Canal.

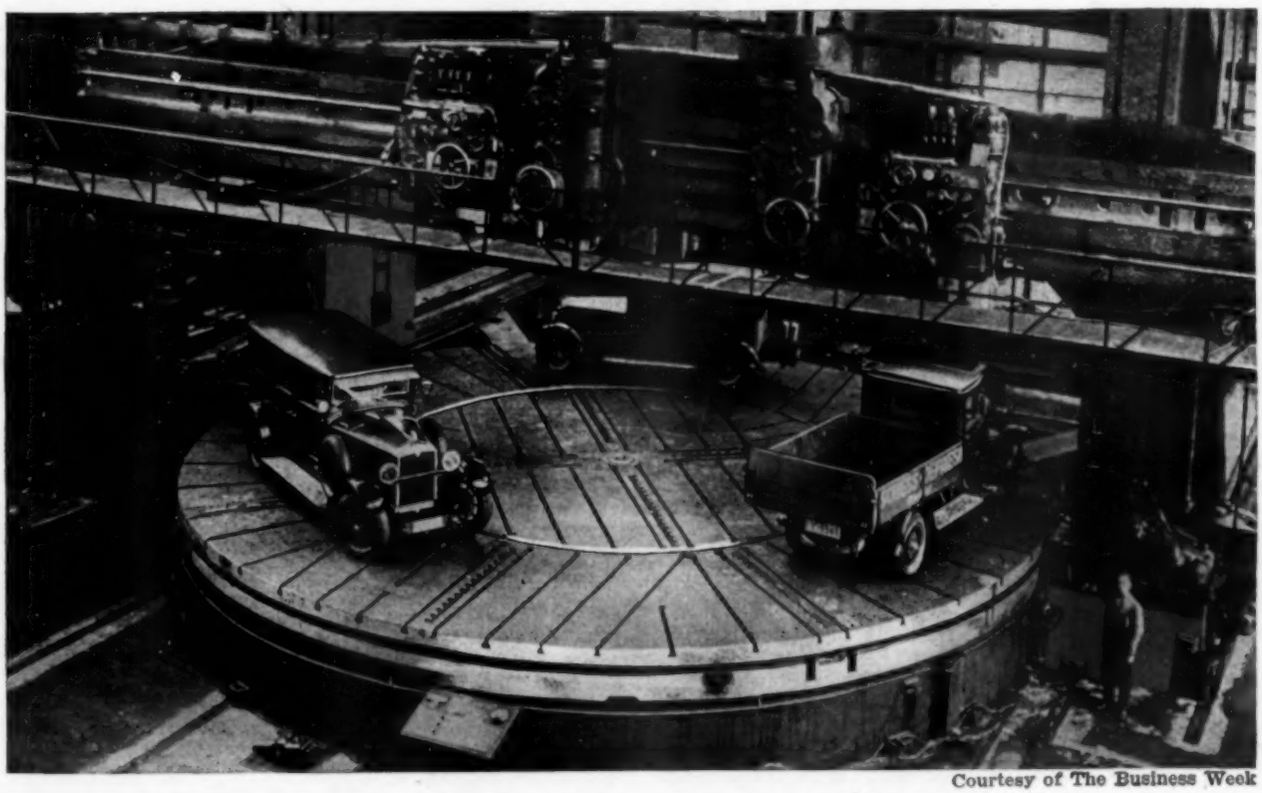
Various mechanical enterprises show favorable balance sheets, and their stocks and shares on the Bourse, though fluctuating from day to day, are not ill-quoted but in the main these industries have merely subsisted, paid wages, salaries, taxes, and small dividends to shareholders, and in reality have expanded but very little. It is largely a question of taxation and fiscal charges. An American economist passing through Paris recently stated that this was the obvious reason why plant expansion, increased output, and a larger buying power did not exist. There was little cash to increase salaries and pay dividends after government claims were met.

A fair picture of the French metal-transforming trades during the year is given by a glance at the situation of the Citroen company. Reading between the lines, it may be suggested that while it may not have reached its goal, it had at least gone a long way in that direction, the more so in that its net profit for the year's operation was 23,209,741 francs.

What is really interesting and of value is what was given out with reference to the plant's machinery and tool equipment. It should stimulate other French manufacturers to "go thou and do likewise." If it does, it means more business for American manufacturers of machine tools, since it is to America that they will have to look for such equipment in the main.

It was stated that as from September, 1928, it was to be considered that the tool equipment of the various Citroen plants was virtually, if not entirely, new. This had shown almost immediately improved results as to output and reduced production costs.

Another World's Greatest—This Time a Boring Mill



Courtesy of The Business Week

This 34-ft. turntable of a mill in the German iron and steel works of Schiess Defries & Company is large enough to be used as a merry-go-round for three automobiles

BUSINESS · BAROMETER

American business is on the mend, with larger freight loadings and increased employment creating optimism

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

THE world is said to have a population of 1,800,000,000. Of this number, not more than 400,000,000 can read and write. Radio experts estimate that of this literate minority about 100,000,000 heard the speech of welcome to the Naval Conference delivered by the King of England on Jan. 21 and broadcast throughout the world. It is also estimated that the King's speech will be read by about 50,000,000 others and that the total number who are interested in the outcome of the Disarmament Conference, or international politics generally, is about 150,000,000, or less than 10 per cent of humanity.

From this brief statement, some idea may be had of the preponderant influence that these 150,000,000 persons have upon international affairs. It is not too much to say that the question of whether future disputes between the nations shall be settled by arbitration or by fighting rests with them. One finds himself wondering whether the World War could not have been averted if an appeal for peace could have been as widely broadcast in 1914 as were the speeches of King George, Secretary Stimson, and Premier MacDonald in 1930.

Certainly the progress of those who "seek peace and pursue it" has been greatly aided by the publicity given to their cause, and if disarmement is to be the outcome of the Conference, its adoption will undoubtedly be accelerated by the speed with which what may be said and done in London is made public.

As this is written the outlook seems to favor an acceptance of disarmament. If it is agreed to, the effect upon business as well as domestic and international politics may be electric. Including the interest and the principal on their war debts, as well as their disbursements for pensions and other forms of war relief, the nations of the world now spend nearly fifteen billion dollars annually in maintaining the armies, navies, and military aircraft that are assumed to be necessary for their protection. If the principle of disarmament is accepted, this expenditure will gradually disappear, and the economic effect may be amazing, even beyond the imagination of those who are working for it.

Therefore, it seems reasonable to expect and to predict that the next upward movement in the speculative markets will come as a result of the hope that peace will be accepted as a substitute for war; that partial disarmament will be immediately agreed upon, and that all the world will soon be converted to the creed that is opposed to human slaughter as a method of deciding human quarrels.

Meanwhile, it is plain that American business is on the mend. President Hoover has announced a decrease in unemployment for the first week of January, reversing the trend which had set in some months ago. Freight car loadings are larger, although they are still somewhat below last year's extraordinary total. The demand for steel and automobiles is gaining and the production of both is increasing. Stock speculation is very dull, but the market seems to be regaining confidence, and a good many long-headed bargain-hunters are now to be seen in Wall Street.

One of the interesting aspects of the situation is to be found in a comparison between the values at which the more important commodities were quoted last Thursday, Jan. 23, 1930, and a year ago. It will be seen that most commodities are now selling for rather less than they would bring at this time last year and as there is no speculative long interest to menace values, the indications are that an improvement in the price of staple merchandise will be seen whenever and wherever a decrease in the supply or an increase in the demand becomes probable.

General business is improving. The cotton textile industry is about the only exception to this statement, and there is some doubt as to whether its melancholia is entirely warranted. In the aggregate the offtake of cotton goods is large, but the orders are small and wholesalers are again complaining that retailers buy only from hand-to-mouth. The dissolution of the Wool Institute will take effect on Jan. 1, 1931. The explanation is that the trade will thereafter govern itself. This announcement is somewhat amusing, as the woolen trade has been conspicuously democratic in its methods for many years.

But these details are comparatively unimportant. The impressive feature of the situation is the gradual return of optimism that is noticeable and the disposition of manufacturers and large distributors to stock up with the merchandise that can be bought without attracting attention.

The decline in silver seems to have run its course, and the rumored corner in the Bombay market appears to be a fact that has relieved the fear that the silver held in East India would soon become entirely worthless.

If to the foregoing concatenations of favorable factors and influences there shall be added the enthusiasm that will come with the hope of permanent peace, and an appreciation of the low values at which most agricultural products are now selling. A substantial advance in the prices of the latter may soon be seen.

From this page the reader will get a quick picture of current business and industry. The boxed material below is a summary of the letters from regional correspondents of the American Machinist, published in full on the opposite page.

JUDGING by the week's reports, spotty conditions exist in the machinery and machine-tool industry of the country. While some sections report better business, other sections report a falling off, opinion being about evenly divided. All sections unite, however, in expressing optimism and in expecting a decided pickup in the immediate future. The used-tool market is showing some improvement, deliveries are holding their own, and prices are not expected to change.

MILWAUKEE business is showing decided improvement, being better than for the last two months. Cincinnati manufacturers are busy, and selling agents report steady demand. Buffalo reports conditions "not so good" at present, but expects good prospects within a fortnight. Present Philadelphia orders are resulting from buying to meet immediate needs, among them orders for hand millers. New England reports continued inquiries and increased orders. New York's major market of the week was in tank cars, the tool market being inclined toward lassitude.

INDIANAPOLIS, however, reports dealers as wondering "where all this pessimistic talk is coming from." All industries are in the market, and demand is good. Railroad inquiries are picking up in Chicago, and business is about as it was. Detroit reports continually bettering conditions, with definite and apparent improvement, resulting in large measure from the return of automotive manufacturers to the market.

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THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine-tool business

THE following reports, gathered from the various machinery and machine-tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

MILWAUKEE

Machine-tool orders have been in about the same volume as they were during the first several weeks of the year and, therefore are greatly increased over those during any fortnight in November or December. Inquiries are slightly increased and cover a wide list of industries. Several inquiries promise to develop into considerable transactions within 30 days. A great many budgets in local large concerns have not yet been completed and await the holding of directors' meetings or executive conferences. The same situation is reported by both machine-tool manufacturers covering the national field and by local dealers. Backlogs, formerly the occasion of considerable delay, have been much reduced.

CINCINNATI

While a small number of the machine-tool manufacturers of the Cincinnati District report a fairly-good demand during the past week, the remainder, with one exception, report the period as being dull. The exceptional company reported that it had received a sudden inflow of miscellaneous orders and was working at night to get out the tools. In the great majority of the machine-tool plants, production is kept at a good level by business previously contracted for, and it is thought that orders coming in from day to day will keep factories running in a normal way.

The greater portion of the week's business was made up of single orders from miscellaneous users. Practically all of the manufacturers report the receipt of a good volume of well-diversified inquiries, the greater portion coming from general machinists and miscellaneous small users.

Selling agents report a fair volume of business in the week. In the opinion of this branch, a better market is developing in local and surrounding territory, because of less hesitancy in purchasing actual needs.

BUFFALO

The middle of January found conditions in the machine-tool trade in Buffalo not so good. The first two weeks of the month were fairly brisk, considering the adverse conditions, but the third week developed a loss of strength. There were some inquiries out for single pieces of equipment, but the number of inquiries were less than had been expected.

Some men in the field and shrewd observers of business trends in this line declared their belief that most of buying up to this time had been by small buyers and that most of the large industries were still in the throes of inventory. They expected this condition to continue for about two weeks more, at least. If this theory is correct, there should be some definite signs of a pickup during the first or second week in February.

Even with conditions as they are the men in the trade seem rather optimistic that conditions will be righted by early summer. One of the good signs is that Bethlehem Steel Co., is pursuing its campaign of construction and expansion unabated.

PHILADELPHIA

There was a marked falling off in the number of sales of machinery and machine tools throughout the Philadelphia market during the last two weeks, a number of the manufacturers and sales representatives reporting that present business is behind what it was at this time last year.

The ease-off which was reported two weeks ago continued throughout the fortnight with the end of the period indicating a greater falling-off than was recorded two weeks ago. There were some sales of hand millers to a Cleveland firm, which was one of the bright spots of the last two weeks, but for the most part the orders resulted only from buying to meet immediate needs. Inquiries for the most part, however, were quite profuse, and most of them appeared to be prospective of early orders.

NEW ENGLAND

Inquiries are coming into the section at a fairly steady rate, and are representative of better business. However, the expected percentage of orders has not started to materialize. Buying is more or less of the hand-to-mouth variety, and sellers are principally occupied with deals hanging fire for some time.

Orders for the week showed a slight improvement over the preceding period with a better demand for new machines. The used machinery field is marking time. Price readjustments in some quarters, however, have revived a latent interest. A number of New England firms who took little or no new equipment during 1929 are known to be arranging budgets for purchases. Steel manufacturers are anticipated as good buyers.

The demand of the week included milling machines, horizontal drills, lathes, a shaper, and grinding equipment. The latter field reports no awakening of the automobile interests. A Hartford company sold 26 edging machines to a Southern textile concern. Rug machinery builders are particularly active in this field.

NEW YORK

Railway car orders were the outstanding events of the week in the metal-working markets of New York. Unusual among these orders were those for 1,425 tank cars, the largest business in this type of car to be concluded at one time for many months. The Texas Co., purchased 925 of them, and the United Car & Equipment purchased the remaining 600. A number of orders for special cars, including acid, cement, and insulated types, also were recorded. Bids for the 130 locomotives for the Chesapeake and affiliated lines will be opened on Jan. 31, and the car list of the C & O opened for bids on Jan. 27. The Missouri-Kansas-Texas will build 500 gondola cars in its own shops. A number of locomotives have been contracted for during the week, one of them, a 50-ton electric, being sold "over the counter" by Westinghouse.

Machinery and machine-tool markets in this district are quiet. Inquiries, still coming in in increasing quantity, indicate that buyers are interested. Few inquiries have been acted upon as yet. The larger dealers handling the standard lines are receiving most of the orders, but almost all orders are for single items only. The larger plants are doing some buying, but from all indications, the "little fellows" are still in the grip of the stock market scare. Deliveries in many lines are as bad as ever. A company making boring machines, which had succeeded in bringing deliveries up ten weeks, has now so much business that deliveries are worse than before. Other companies are just about holding even. Engine lathes are the only tools that can be bought "off the shelf." Machine-tool plants are busy, and expect to be busier soon. All in all, the situation augurs well, if the Scotch attitude of smaller buyers can be overcome.

INDIANAPOLIS

The local machinery and machine-tool trade is beginning to wonder where all this pessimistic talk is coming from. Since the first of the year, business has opened up far better than had been expected in view of stock reverses and a lot of loose conversation about retrenchments and the like. Judging from the local demand, nearly every industry on which the machinery trade depends is in the market. From all present indications, January this year will be much better in volume than the same month of last year.

Weather conditions have been such that railroads have been compelled to retire much motive equipment to the shops for repairs. The railroads are steady buyers at the present time. Automobile manufacturers also are beginning to enter the market in a much larger way. New models are to be put in production following the New York Show, where the general tone was said to be optimistic, according to local manufacturers.

Demand from the electric and gas utilities will be very large. It is estimated that $25,000,000 will be spent by electric utilities alone in new improvements this year in Indiana.

CHICAGO

Business in the machine-tool industry has shown little change during the last week. Inquiries, aside from railroad, continue to be for single tools or small lots. Exceptions are reported, the Allis-Chalmers Co. and the A. O. Smith Corporation having closed for a number of tools for which inquiry had been made some time back. One Mid-West manufacturer of a diversified line of machine shop equipment reports a large maker of automobiles as inquiring for four tools of considerable importance. For the greater part, selling agents and district managers report that January will show an improvement in sales over December of from ten to twenty per cent. The used-tool market is reported as having shown an upward curve. Demand for small electrical tools is quiet.

DETROIT

Sales of machinery and machine tools have increased materially within the past ten days, and the receipt of an unusually large number of inquiries indicates that business will continue to improve.

In general, the dealers here are experiencing a much better condition than that which existed early in January. There is a healthier attitude on the part of automobile and accessory manufacturers and a willingness to consider plans for the future. The market is still spotty and irregular but the improvement is definite and apparent.

One of the outstanding dealers in specialized machinery reported an unusually large volume of sales in January. The total exceeds that of January, 1929, which was considered a good month. All of the sales were made to the automotive industry.

Business Items

John Bath & Co., Inc., 18 Grafton St., Worcester, Mass., has established direct factory representation in Michigan, Illinois, Indiana, and Wisconsin. Frank A. Ford will become western sales manager with offices at 803 Fisher Bldg., Detroit. Peter Collins will be his assistant in Detroit. H. E. Richmond, with offices in Detroit, will handle Michigan. L. T. Bohnet and E. G. Doran will handle Indiana, Illinois, and Wisconsin, with offices at 2150 Chicago Daily News Bldg., Chicago.

The Morse-Grau Tool & Manufacturing Co. has completed installation of equipment at 1520 E. Slauson Ave., Los Angeles, and is now in full operation, according to an announcement by William S. Grau, general manager. William S. Morse, owner of the Morse Counterbore & Tool Co., Detroit, is president. The company now has more than 5,800 sq.ft. of floor space in the plant.

The Oliver H. Van Horn Co., Inc., New Orleans, La., has opened a branch at 311 Market St., Shreveport, La., as a separate corporation, to be known as Oliver H. Van Horn Co., Shreveport. Percy F. Richards, secretary-manager of the new company, will be in charge. The company now operates branches in New Orleans, Shreveport, and Houston.

The main offices of W. H. Bixby, Inc. have been moved from Omaha, Neb., to 1004 Hubbell Bldg., Des Moines, Iowa. The company is representative for Taylor Underfeed Stokers and Lo-Hed Monorail Electric Hoists, manufactured by the American Engineering Co., Philadelphia.

The H. H. Franklin Manufacturing Co., Syracuse, N. Y., has acquired complete control of the Franklin Die Casting Corporation in that city, according to a director's announcement. Officers elected at the annual meeting are: L. J. Purdy, president; R. O. Brown, vice-president; F. A. Barton, treasurer; and J. E. Halligan, secretary.

The Skinner Co., Gananoque, Ont., subsidiary of the Houdaille-Hershey Corporation, Detroit, will put its automobile bumper plant near Oshawa into operation on Feb. 1, with a force of 200 employes. Machinery and equipment is now being placed. The building is 127x 416 ft. and cost $25,000.

The Jeannin Electric Co., Toledo, Ohio, has been purchased by the Howell Electric Motors Co., Howell, Mich. Manufacturing equipment and business of the Jeannin company will be moved to the Howell plant gradually, so as not to interrupt manufacture.

The Vanadium Alloy Steel Co., Latrobe, Pa., and the Colonial Steel Co., Pittsburgh, occupied new quarters on the twenty-fourth floor of the Grant Bldg., beginning Jan. 18, 1930.

The Buffalo Steam Pump Co., P. O. Box 985, Buffalo, N. Y., elected the following directors at the annual meeting on Jan. 14: Edgar F. Wendt, Henry W. Wendt, Robert G. Nye, Amos G. Peterson. The directors elected the following officers: Edgar F. Wendt, president and treasurer; Henry W. Wendt, Jr., vice-president; Amos G. Peterson, secretary; Robert G. Nye, factory manager.

Personals

WALTER W. TANGEMAN, general sales manager of the Cincinnati Milling Machine Co., Cincinnati, Ohio, has been advanced to vice-president. Mr. Tangeman has been affiliated with the Cincinnati company since 1909, when he began his co-operative schooling at the University of Cincinnati. FREDERICK B. HEITKAMP has been appointed general sales manager to succeed Mr. Tangeman. Mr. Heitkamp is a graduate of Rutgers University, and has been associated with the company since 1921, lately as assistant sales manager.

ARTHUR C. PLETZ, assistant general sales manager of the Pratt & Whitney Co. a division of the Niles-Bement-Pond Co., Hartford, Conn., has resigned to become works manager of the Aluminum Industries, Inc., Cincinnati, Ohio, effective Feb. 1. WILLIAM LAW, sales engineer for the Pratt & Whitney Co., has been made manager of the agency sales division.

P. P. EVANS has been elected president of the Osborn Engineering Co., Cleveland. Other newly elected officers are: E. H. BIRNEY, vice-president; T. T. HUBBARD, treasurer; and KENNETH H. OSBORN, secretary. Mr. Birney is a director of the Reynolds Machine Co., Massillon, Ohio, and founder of several other industrial concerns in that city.

GEORGE ERWIN, JR., sales manager of the Kearney & Trecker Corporation, Milwaukee, was the host at the January meeting of the Machine-Tool Distributors, Chicago district, held at the University Club, Milwaukee, on Jan. 16. An inspection of the Kearney & Trecker plant followed the regular order of business.

JOSEPH V. SANTRY has been appointed head of the International Combustion Engineering Corporation, New York, to succeed COL. H. D. SAVAGE, who is assisting the receivers of the company. Mr. Santry was president for four years previously, resigning about two years ago.

O. F. MANDT, general manager of the Jaeger Machine Co., Columbus, Ohio, was named president of the American Paver & Mixer Manufacturing Ass'n at the annual meeting in Atlantic City, N. J., on Jan. 15. He has been affiliated with the Jaeger company for more than four years.

LAWRENCE P. DWYER, formerly president of the Dwyer Equipment Co., Chicago, has been appointed general manager of the unit division of the C. A. Dunham Co., recent purchaser of the Dwyer business. WILLIAM J. MAUER, formerly vice-president of the Dwyer company, becomes sales manager of the unit heater division. Both will have their headquarters at the general offices of the Dunham company at Chicago.

J. G. SWAIN, formerly vice-president of the Firestone Steel Products Co., Akron, Ohio, has been made head of the rim sales department of the Goodyear Tire & Rubber Co. Mr. Swain, organizer of the Firestone Steel Products Co., is a graduate of Purdue University.

JACK L. HILTON, formerly manager of the plate-fabricating department, Commercial Shearing & Stamping Co., Youngstown, Ohio, has become manager of Dalzell Bros. Co., Youngstown. He was formerly manager of the Sharpsville Boiler Co., Sharpsville, Pennsylvania.

THOMAS J. LITLE, JR., until recently chief engineer of the Marmon Motor

Car Co., Indianapolis, Ind., has been appointed director of engineering of the Holley Carburetor Co., Detroit.

R. G. WELLS, assistant chief engineer of the Trundle Engineering Co., Cleveland, has been appointed chief engineer to succeed MR. EICHOFF, recently resigned. PAUL VAN SITTERT has been appointed assistant chief engineer to succeed Mr. Wells.

R. H. STARTZELL has been appointed district representative of the Sheffield Steel Corporation, Kansas City, Mo., for Dallas, Texas, with headquarters at 1110 Santa Fe Bldg., Dallas. He succeeds T. P. BARRY, JR., who now represents the Tulsa Rolling Mills.

ALLEN H. HEAD, vice-president and general manager of the John Deere Tractor Co., Waterloo, Iowa, was elected a member of the board of directors of the Commercial National Bank, Waterloo, at the stockholders' annual meeting last week.

GEORGE ATHERTON has been appointed manager of the Detroit sales office of the American Radiator Co. of Michigan to succeed A. H. WILLIAMSON, granted a leave of absence to regain his health. Mr. Atherton has been with the company for more than 20 years.

WILLIAM S. GRAU is general manager of the Morse-Grau Tool & Manufacturing Co., 1520 E. Slauson Ave., Los Angeles. He was for eight years superintendent of production at the Union Tool Co., Los Angeles, where he

started as tool designer. For the last two years he has been superintendent of production at the Doheny-Stone Drill Co., Torrance, Calif., where he supervised purchase and installation of all machine tool and heat-treating equipment.

HAROLD H. EMMONS has resigned as chairman of the board of the Detroit Aircraft Corporation, Detroit. FRANK W. BLAIR, chairman of the Union Trust Co., Detroit, has been appointed his successor.

LYMAN A. MARKEL has become a member of the engineering sales force of the Tarrier Steel Co., Columbus, Ohio. He was formerly construction engineer for the Pan-American Petroleum Co., Los Angeles.

A. J. KIEHNE, formerly engineering representative of the Greenfield Tap & Die Corporation, Greenfield, Mass., is now associated as a partner with C. D. Eno of the Eno Supply Co., Toledo, Ohio.

A. H. LAUER, manager of the Sharon (Pa.) works of the American Steel Foundries, has been transferred to Granite City, Ill. He is succeeded at Sharon by ALBERT E. MOSES.

JOHN E. WETZEL has been appointed general sales manager of the Superior Steel Corporation, Pittsburgh.

Obituaries

CHARLES M. HILL, 82, died on Jan. 15 in Moline, Ill., where he had resided more than half a century. He was a member of the firm of Hill, Sargent & Co., which became the Moline Malleable Co., later Dimock, Gould & Co., and afterward the D. M. Sechler Carriage Company.

CLARENCE W. HODGES, purchasing agent for the Worthington Pump & Machinery Co., died at the Paterson (N. J.) Hospital, on Jan. 17. He was born at Randolph, Vt., in 1876 and was graduated from Williams College in 1900. Previous to his connection with the Worthington company, he had been purchasing agent for the American Locomotive Company.

GEORGE J. LONG, 77, vice-president of the United States Foundry & Pipe Co. until 1920, died suddenly in Louisville, Ky., on Jan. 15. He had been president of Dennis Long & Co. until 1900, when the company was merged with other foundries and became part of the United States company.

J. H. PECKHAM, for some years Connecticut representative of Henry Prentiss & Co., Singer Bldg., New York, at the Hartford (Conn.) offices, died on Jan. 22 in that city. He was previously employed by the Norton Co., Worcester, Massachusetts.

CHARLES W. LUTZ, 62, manager of plants of the American Steel & Wire Co. at various times, assistant district manager at Pittsburgh, and still later district manager until his retirement years ago, died of heart disease on Jan. 6 at his home in Chicago.

CHARLES E. WILLIAMS, general manager of the Gilbert Clock Co., Winsted, Mass., for the past 15 years, died Jan. 20 at the Litchfield County Hospital following an illness of five weeks. Mr. Williams was born in Clinton, N. Y., and was 60 years of age.

EDWARD O. FELTHOUSEN, 67, former president of the Acme Steel & Malleable Iron Works, Buffalo, N. Y., died at his home in that city, Jan. 15, following a cerebral hemorrhage, caused by a recent fall. He retired in 1917.

EDWARD J. BOWEN, president of the Union Tank & Pipe Co., Los Angeles, was killed in the crash of the T.A.T.-Maddux air liner on Jan. 19, in which 16 persons lost their lives near San Clemente, California.

JAY M. BARTHOLOMEW, 61, president and general manager of the Sayre Stamping Works, Inc., Waverly, N. Y., died at the Robert Packer Hospital in that city Jan. 16, following a long illness.

WARREN P. KING, 64, vice-president, Aluminum Co. of America, died Jan. 15 at Sarasota, Fla. He was born in Ithaca, N. Y., and was a graduate of Cornell University.

ALEXIS DARUSMONT, SR., retired president of the Cincinnati Stamping Co., Cincinnati, died of a heart attack on Jan. 17 at Cincinnati. He was 70 years of age.

WILLIAM R. SHARP, 70, founder of the Sharp Manufacturing & Supply Co., New Philadelphia, Ohio, died on Jan. 15 at his home in that city.

ERNEST L. BURRELL, formerly president of the Burrell Belting Co., Chicago, died in New York on Jan. 16, aged 65 years.

L. E. CURTIS, president of the Lee Machinery Co., Detroit, died suddenly on Jan. 3.

WILLIAM A. LEE, 83, reputed inventor of the disk drill, died at his home in Blackwell, Okla., recently.

Forthcoming Meetings

AMERICAN MANAGEMENT ASSOCIATION—Personnel Administration Conference, Hotel Statler, Cleveland, Ohio, Jan. 29-31. Headquarters of the Association, 20 Vesey St., New York.

FIFTH MACHINERY CONFERENCE—U. S. Chamber of Commerce Bldg., H St., Washington, D. C., on Feb. 3 at 9 A.M. Another in the series of conferences of associations. Ernest F. DuBrul, 1415 Enquirer Bldg., Cincinnati, Ohio, is chairman.

AMERICAN SOCIETY OF STEEL TREATERS—Semi-annual meeting, Hotel Pennsylvania, New York City, Feb. 7 and 8, 1930. W. H. Eisenman, 7016 Euclid Ave., Cleveland, is secretary.

ENGINEERING INSTITUTE OF CANADA—Annual meeting Feb. 12-14. R. J. Durley, 2050 Mansfield St., Montreal, Que., is secretary.

AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS—Annual meeting, Feb. 17-20, New York City. H. Foster Bain, 29 West 39th St., N. Y., is secretary.

NATIONAL MANAGEMENT CONGRESS—Stevens Hotel, Chicago, March 3 to 5. National Industrial Equipment Exposition in connection, March 3 to 7. G. E. Pfisterer, 308 W. Washington St., Chicago, is manager.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—National Materials Handling meeting, March 5-7, Stevens Hotel, Chicago. Calvin W. Rice, 29 W. 39th St., New York, secretary.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Fiftieth Anniversary Celebration, Opens in New York, April 5, afternoon in Hoboken; April 6 in New York; April 7, 8, and 9 in Washington, D. C. Calvin W. Rice, 29 W. 39th St., New York, is secretary.

AMERICAN FOUNDRYMEN'S ASSOCIATION—Annual Convention, Cleveland Public Auditorium, Cleveland, Ohio, May 12-17. C. E. Hoyt, 222 W. Adams St., Chicago, is secretary-treasurer.

SOCIETY OF AUTOMOTIVE ENGINEERS—1930 Summer Meeting, French Lick Springs Hotel, French Lick Springs, Ind., May 25-29. National headquarters are at 29 W. 39th St., New York City.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Semi-annual meeting, Hotel Book-Cadillac, Detroit, June 2 to 12. Calvin W. Rice, 29 West 39th St., New York City, is secretary.

STEEL INDUSTRY'S EXECUTIVES—Annual Iron & Steel Exposition. Under the sponsorship of the Iron & Steel Electrical Engineers, June 16-20, Broadway Auditorium, Buffalo, N. Y. John F. Kelly, 1010 Empire Bldg., Pittsburgh, Pa., is managing director.

AMERICAN SOCIETY FOR TESTING MATERIALS—Annual meeting, Haddon Hall, Atlantic City, N. J. June 23-27. C. L. Warwick, 1315 Spruce Street, Philadelphia, is secretary-treasurer.

THE WEEKLY PRICE GUIDE . . .

Rise and Fall of the Market

FOLLOWING the price decline which occurred a week ago in the principal hot-rolled steel products, black and galvanized sheets have dropped 10c. per 100 lb. at Pittsburgh, with more drastic reductions reported in Cleveland. Tin, antimony and solder contributed this week to the downward movement which has prevailed for the last month in non-ferrous metals. Linseed oil is off 1.1c. per lb. (14.8c.) at New York. The only advance of significance was that of 0.05c. per lb. (5.2c.) in slab zinc at East St. Louis.

(All prices as of Jan. 24, 1930)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$17.69@$18.19
Northern Basic	19.90
Southern Ohio No. 2	19.90
NEW YORK—Tidewater Delivery	
No. 2 Southern (silicon 1.75@2.25)	19.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	15.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76@22.26
Virginia No. 2	24.04
Basic	19.75@20.25
CHICAGO	
No. 2 Foundry, local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	20.01
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	20 26
Basic	20 26
Bessemer	20.76

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.50
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.10@2.20	3.35	3.30	3.90†
No. 12	2.15@2.25	3.45	3.35	3.95†
No. 14	2.25@2.35	3.55	3.45	4.00†
No. 16	2.35@2.45	3.65	3.55	4.10†
Black				
Nos. 18 to 20	2.45@2.55	3.85	3.55	3.70
No. 22	2.60@2.70	4.00	3.70	3.85
No. 24	2.65@2.75	4.05	3.75	3.90
No. 26	2.75@2.85	4.15	3.85	4.00
No. 28	2.90@3.00	4.75	4.00	4.15
Galvanized				
No. 10	2.60@2.70	4.20	3.80	3.80
Nos. 12 to 14	2.70@2.80	4.30	3.90	3.90
No. 16	2.80@2.90	4.40	4.00	4.00
No. 18	2.95@3.05	4.55	4.15	4.15
No. 20	3.10@3.20	4.70	4.30	4.30
No. 22	3.15@3.25	4.75	4.35	4.35
No. 24	3.30@3.40	4.90	4.50	4.50
No. 26	3.55@3.65	5.15	4.75	4.75
No. 28	3.80@3.90	5.40	5.00	5.00

*Light plates. †Up to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. butt	53.74%	41.2%	55.5%	43.5%	55.5%	42.5%
3½ to 6 in. lap	50.32%	37.78%	53.5%	40.5%	51.6%	39.0%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
⅛	$0.17	1.315	1.049	.133
¼	.23	1.66	1.38	.14
⅜	.27⅛	1.9	1.61	.145
½	.37	2.375	2.067	.154
⅝	.58⅛	2.875	2.469	.203
¾	.76⅛	3.5	3.068	.216
⅞	.92	4.0	3.548	.226
1	1.09	4.5	4.026	.237
1½	1.48	5.563	5.047	.258
2	1.92	6.625	6.065	.28
3	2.50	8.625	8.071	.277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb:

Thickness—Decimal Fractions	B.w.g. and	Outside Diameter in Inches—⅛	¼	⅜	½	⅝	¾	1	1¼	1½
		Price per Foot								
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23		
.049"	18	.17	.18	.19	.20	.21	.23	.25		
.065"	16	.19	.20	.21	.22	.23	.25	.27		
.083"	14	.20	.22	.23	.24	.25	.27	.29		
.095"	13	.21	.23	.25	.26	.27	.29	.31		
.109"	12	.22	.24	.26	.27	.28	.30	.32		
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33		
.134"	10	.24	.26	.28	.29	.30	.32	.34		

MISCELLANEOUS—Warehouse base prices in cents per lb:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.25†	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10†	5.30	5.00
Cold drawn, round or hexagon‡	3.50	3.65	3.60
Cold drawn, flat or square‡	4.00	4.15	4.10
Structural shapes	3.30†	3.00	3.10
Soft steel bars	3.25†	3.00	3.00
Soft steel bar shapes	3.25†	3.00	3.00
Soft steel bands	3.75†	3.65	3.65
Tank plates	3.30†	3.00	3.10
Bar iron (2.75 at mill)	3.25	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, $\frac{3}{16}$-in. thick. †Up to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse— $\frac{3}{32}$, 8.35c. per lb.; ⅛, 7.85c. per lb.; $\frac{5}{32}$ to ¼, 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			19.25
Tin, Straits, pigs, New York			40.75@41.75
Lead, pigs, E. St. Louis	6.10	New York	7.00@ 7.50
Zinc, slabs, E. St. Louis	5.20	New York	6.75@ 7.25

	New York	Cleveland	Chicago
Antimony, slabs	10.50@11.00	11.50	14.50
Copper sheets, base	27.75	27.75	27.75
Copper wire, base	20.12½	20.12½	20.12½
Copper, drawn, round, base	26.25	26.25	26.25
Copper tubing, base	29.25	29.25	29.25
Brass sheets, high, base	23.25	23.25	23.25
Brass tubing, high, base	28.25	28.25	28.25
Brass rods, high, base	21.25	21.25	21.25
Brass wire, high, base	23.75	23.75	23.75

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	25@26	24.30	24.30
Zinc sheets (casks).....	10.75@11.25	12.25	10.11
Solder (½ and ½).....	29.50	29.75	28@30
Babbitt metal, delivered in case lots, New York, cents per lb:			
Genuine, highest grade.....			57.00
Commercial genuine, intermediate grade.....			42.00
Anti-friction metal, general service.....			31.00
No. 4 babbitt, f.o.b.....			11.50

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va:

	Nickel	Monel Metal
Sheets, full finished.....	52.00	42.00
Sheets, cold rolled.....	60.00	50.00
Strip, cold rolled.....	55.00	45.00
Rods, hot rolled.....	45.00	35.00
Rods, cold drawn.....	53.00	40.00
Tubing	75.00*	90.00†
Angles, not rolled.....	50.00	40.00
Plates.....	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars:

	New York	Cleveland	Chicago
Crucible copper.....	14.50 @15.00	13.50	13.00 @13.50
Copper, heavy, and wire..	13.50 @13.75	13.00	12.25 @12.75
Copper, light, and bottoms	12.00 @12.25	12.00	11.25 @11.75
Heavy lead.....	4.50 @ 5.00	5.25	4.25 @ 4.75
Tea lead.....	2.87½@ 3.12½	3.25	3.25 @ 3.75
Brass, heavy, yellow.....	7.75 @ 8.00	8.00	7.25 @ 7.75
Brass, heavy, red.....	11.00 @11.50	12.50	10.25 @10.75
Brass, light.....	6.25 @ 6.75	7.00	6.25 @ 6.75
No. 1 rod-brass turnings..	9.00 @ 9.25	8.00	7.75 @ 8.25
Zinc.....	2.50 @ 2.75	3.00	2.00 @ 2.50

TIN PLATES—Charcoal—Bright—Per box:

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 14x20.....	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20.....	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20.....	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb..	$0.13*	$0.16	$0.15
Cotton waste, colored, per lb..	.09½*	.12	.12
Wiping cloths, washed, white, per lb.....	.12½	38.00 per M	.16
Sal soda, per lb.....	.02½	.02	.02
Roll sulphur, per lb.....	.028	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.....	.148	.164	159
Cutting oil, about 25% lard, in 5 gal. cans, per gal.....	.65	.60	.65
Machine oil, medium-bodied (55 gal. steel bbl.) per gal..	.33	.36	.24
Belting — Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin. ft., per inch of width, for single ply:			
Medium grade.....	30–10%	30–10%	35%
Med. grade, heavy wgt..	30%	30– 5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft:			
First grade.....	50%	50–10%	50%
Second grade.....	60%	60– 5%	50–10%

*Grade F.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb..	$0.0325	$0.0325	$0.0325
Cold drawn shafting...	per lb..	.035	.035	.034
Brass rods.....	per lb..	.2125	.2125	.19
Solder (½ and ½).....	per lb..	.295	.295	.345
Cotton waste, white...	per lb..	.13	.13	.10@.13½
Disks, aluminum oxide mineral, cloth, No. 1, 6-in. dia.....	per 100.	4.59	4.59	3.59
Lard cutting oil.....	per gal.	.65	.65	.65
Machine oil.....	per gal.	.33	.33	.30
Belting, leather, medium.....	off list..	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs...	off list..	50-10%*	50–10%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*.....	$6.03	$6.03	$6.03
Emery cloth*.....	25.87	25.87	25.87
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†.....	2.61	2.61	2.61
Cloth†.....	4.59	4.59	4.59
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton.....	Connellsville, 2.60@2.65		
Coke, prompt foundry, per net ton.....	Connellsville, 3.50@4.85		
White lead, dry.....	100 lb. kegs ...	New York,	13.75
White lead, in oil.....	100 lb. kegs....	New York,	14.25
Red lead, dry.....	100 lb. kegs....	New York,	13.75
Red lead, in oil.....	100 lb. kegs....	New York,	15.25

*Less than 3 reams. †Less than 200.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less.....	60%
Larger, up to 1 x 30-in., full kegs, list less.....	50–10%
Less than full kegs or case lots, add to list.....	10%
Fitting-up bolts: list less.....	45%
Lag screws:	
Up to ½-in. x 6-in., list less.....	60%
Larger, list less.....	50–10%
Less than full keg or case lots, add to list.....	10%
Rivets:	
Structural, round head, full kegs, net.....	$4.50
Structural, round head, broken kegs, net.....	6.00
Tank, ⅞-in. dia. and smaller, list less.....	60%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less.....	60%
Larger, up to 3-in., list less.....	40–10%
Less than keg or case lots, add to list.....	10%
Washers:	
Wrought, full kegs, per 100 lb., list less.....	$4.00
Wrought, broken kegs, per 100 lb., list less.....	2.00
Turnbuckles:	
With stub ends, list less.....	20%
Without stub ends, list less.....	50%
Chain:	
Proof coil, base, per 100 lb., net.....	$7.10
Cast iron welding flux, per lb., net.....	.40
Brazing flux, per lb., net.....	.80

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

Mich., Detroit—Haskell Machinery Co., 416 Woodbridge St.—24 in. shaper.

Mich., Detroit—Precise Instrument Co., 2033 Park Ave.—drill and equipment.

Ore., Marshfield—Tower Auto Co., Marshfield —machine tools, lathes, etc., for proposed 75 x 140 ft. garage.

Ont., London—Sparks Withington Co., Jackson, Mich.—complete new equipment for manufacture of Sparton radio sets and auto signals. Factory of the Sherlock Manning Piano Co. purchased.

Opportunities for Future Business

Ala., Birmingham — Southern State Equipment Co., 1923 Powell Ave., acquired a site and plans the construction of a plant to supplement present plant.

Calif., Fresno — Irrigation Engineering Co., 206 North H St., plans the construction of a 1 story, 75 x 100 ft. shop building for the manufacture and repair of pumps, etc., on North H St.

Calif., Los Angeles—Audio Vision Appliance Co., 1016 Sycamore St., awarded contract for a 2 story, 60 x 150 ft. factory at 1012 North Sycamore Ave. Estimated cost $60,000.

Calif., Los Angeles — Crane Co., 321 East 32nd St., awarded contract for first unit of factory, 1 story, 80 x 400 ft. for the manufacture of heavy plumbing supplies and materials.

Conn., New Haven — Brock-Hall Dairy Co., Inc., 1204 Whitney Ave., is having plans prepared for the construction of a 2 story, 70 x 115 ft. garage and repair shop on Whitney Ave. Estimated cost $60,000. R. W. Foote, 185 Church St., Archt.

Conn., New Haven—Shell Eastern Petroleum Products Inc., 42 Church St., awarded contract for a 1 story, 40 x 250 ft. garage, etc. Estimated cost $50,000.

D. C., Washington — Washington Air Terminals Corp., National Press Bldg., awarded contract for the construction of a 125 x 130 ft. aeroplane hangar and shop.

Idaho, Twin Falls — Firestone Rubber Co., plans the construction of a 100 x 125 ft. garage. Estimated cost $40,000.

Ind., Gary—National Steel Corp., Pittsburgh, Pa., purchased a 1,000 acre tract on Lake Michigan and plans a steel mill to include blast furnaces, complete ingot iron facilities and finishing mills. Estimated cost approximately $40,000,000 to $50,000,000. C. H. Hunt, Ch. Engr., Wierton Steel Co., Wierton, W. Va., and J. A. Clauss, Ch. Engr., Great Lakes Steel Corp., Detroit, Mich., Engrs.

La., Harvey — Continental Can Co., Inc., 1 Pershing Sq., New York, N. Y., acquired a site and plans plant expansion.

Md., Baltimore—Locke Insulator Co., Charles and Cromwell Sts., awarded contract for kiln, manufacturing and castings buildings at Charles and Cromwell Sts.

Mass., Malden (Boston P. O.)—Malden Machine Tool Co., 158 Exchange St., is having revised plans prepared for the construction of a 1 story, 60 x 100 ft. machine shop on Abbott Rd. Estimated cost $30,000. C. F. Springall, 50 Park St. Noted Dec. 12.

Mass., Norwood — Norwood Press Co., 932 Washington St., awarded contract for a 1 story, 62 x 81 and 26 x 62 ft. additions to bindery and foundry. Estimated cost $40,000.

Mass., Somerville (Boston P. O.) — Herlihy Bros., Inc., 65 Washington St., will build a 1 story, 63 x 105 ft. garage and repair shop on Myrtle St. Private plans.

Mich., Detroit — Great Lakes Steel Corp., Union Trust Bldg., awarded contract for a continuous merchant bar mill, will have extremely wide range of sizes and have productive capacity of approximately 20,000 tons per mo. Estimated cost $3,500,000. J. A. Clauss, c/o owner, Engr.

Mich., Detroit — Michigan Tool Co., O. Lundell, Pres., manufacturers of cutters and tools, awarded contract for the design and construction of a 2 story, 190 x 260 ft. plant at Carey St. and Six Mile Rd. Estimated cost $300,000.

N. J., Bordentown—State of New Jersey, Institutions & Agencies, Trenton, soon awards contract for construction of 2 story, trades building at Manual Training & Industrial School here.

N. J., Kearny—Western Electric Co., Inc., 195 Broadway, New York, N. Y., will receive bids until Jan. 30 for factory buildings No. 40 E. 41 and 42 on Central Ave. here. Estimated cost $500,000. Private plans.

N. J., Newark—J. Weisberger, 73 Badger St., will build a 1 story, 135 x 185 ft. machine shop at 183-197 Magra St. Estimated cost $40,000. Private plans. Noted Jan. 23.

N. J., Paterson—City planning Commission, B. H. Saunders, Pres., City Hall, plans the construction of a garage on Straight St. Estimated cost $150,000. Architect not selected.

N. Y., Albany—New York Power & Light Co., 126 State St., is receiving bids for the construction of a 3 story machine shop, garage, warehouse, etc., on Broadway. Estimated cost $500,000. Stevens & Wood, 60 John St., New York, Archts. and Engrs.

N. Y., Brooklyn — C. and L. Bennett, 465 Fenimore St., plans a 1 story, 100 x 215 ft. garage at Fenimore St. and Brooklyn Ave. Estimated cost $50,000. H. M. Sushan, 367 Fulton St., Archt.

N. Y., Brooklyn—Brooklyn & Queens Transit Corp., 385 Flatbush Exten., awarded contract for construction of terminal sheds and service building, Surf and Stillwell Aves.

N. Y., Brooklyn—Fulton Criterion Co., Fulton St. and Grand Ave., plans the construction of a 2 story garage. Estimated cost $75,000. H. M. Sushan, 367 Fulton St., Archt. Maturity about May 1.

N. Y., Brooklyn—Goetz Bros., 153 Pierrepont St., plans the construction of a 2 story, 65 x 132 ft. garage at Newkirk Ave. and Marlborough Rd. Estimated cost $100,000. Seelig & Finkelstein, 153 Pierrepont St., Archts. Maturity about May 1. Noted Jan. 16.

N. Y., Brooklyn—R. Oliva, 1987 New York Ave., plans a 100 x 160 ft. garage at East 18th St. and Ave. Y. Estimated cost $80,000. Private plans. Maturity in May. Noted Jan. 16.

N. Y., Brooklyn—P. Tague, 163 Washington Ave., will soon award contract for the construction of a garage, etc. at 167 Washington St. Estimated cost $40,000. J. J. Carroll, 225 Greene Ave., Archt.

N. Y., Forest Hills—Cord Meyer Development Co., Queens and Continental Aves., will build a 4 story garage at Queens Blvd. and Seminole Ave. Estimated cost $200,000. T. Engelhard, c/o owner, Archt.

N. Y., Forest Park—Dept. of Parks, Boro of Queens, will receive bids late in February for the construction of a service building at 88th Pl. and Myrtle Ave. Estimated cost $60,000. A. Grande, Archt.

N. Y., Jamaica — New York Ave. Holding Corp., 160-16 Jamaica Ave., plans the construction of a garage at New York Blvd. and Jamaica Ave. Estimated cost $150,000. M. Klein, 65 Court St., Brooklyn, Archt.

N. Y., Jamaica — R. Weissmantel, 139-13 Hillside Ave., having plans prepared, for the construction of a 1 story, service garage, 130th St. and 89th Ave. Est. $40,000.

N. Y., Long Island City—Queens Developers, 1325 Eastern Parkway, Brooklyn, having plans prepared for construction of service garage, Dahlia and Crommelin Aves. Farber & Kalkin, 1746 Pitkin Ave., Brooklyn. Est. $40,000.

N. Y., Maspeth—H. C. Bohack, Inc., Flushing and Metropolitan Ave., is receiving bids for a 1 story garage and service building. Estimated cost $40,000. Koch & Wagner, 32 Court St., Brooklyn, Archts.

N. Y., New York—Harms Building Co., H. Aginsky, Pres., 701 East Tremont St., plans a 1 story, 90 x 100 ft. garage, etc. at Jerome Ave. and Featherbed Lane. Work by separate contracts. Estimated cost $40,000. H. Nordheim, 565 East Tremont Ave., Archt.

N. Y., New York—Keyrose Garage Corp., M. Luftig, Pres., 1123 Intervale Ave., plans the construction of a 2 story, 48 x 155 ft. garage at Manor Ave. and 174th St. Estimated cost $75,000. C. S. Clark, 441 East Tremont Ave., Archt.

N. Y., New York—Ninety Fourth St. Holding Corp., 1619 52nd St., Brooklyn, awarded contract for a 4 story garage at 312 East 94th St., here. Estimated cost $125,000. Noted Aug. 1.

N. Y., New York—Rubel Corp., S. Rubel, Pres., 937 Fulton St., Brooklyn, plans the construction of a 2 story, 96 x 125 ft. garage at 521 West 21st St. Estimated cost $150,000. H. J. Nurick, 44 Court St., Brooklyn, Archt.

N. Y., Niagara Falls—Frontier Bronze Co., 818 Elmwood Ave., plans addition to plant. Estimated cost $40,000.

N. Y., Rosebank (Staten Island P. O.) — O'Brien Bros. Ship Yard Corp., 2269 Richmond Terrace, Port Richmond and 233 Bway., New York, plan construction of ship yard, pier, drydock, etc.

N. Y., Yonkers—Fain Cap Corp., 844 Lenox Rd., New York, is receiving bids for a 2 story garage on Saw Mill River Rd. here. Estimated cost to exceed $40,000. E. J. Brogan, Yonkers, Archt.

N. C., Charlotte—E. F. Griffith, Charlotte, having plans prepared for 1 story, 60 x 170 ft. factory, with 2 story 40 x 60 ft. office. Lockwood Greene, Engineers, Inc., Charlotte, Engrs. and Archts. Graybar Electric Co., Charlotte, lessee.

Ohio—Highway Dept., R. N. Waid, Dir., Ohio Hartman Bldg., is having plans prepared for the construction of three 60 x 160 ft., and one 60 x 220 ft. garage buildings, at Celina, Urbana, Troy and Sidney.

O., Dayton—U. S. Army, awarded contract for the construction of a repair shop for airplanes and parts at Fairfield air depot near here. Estimated cost $200,000.

Pa., Midland—Mackintosh Hemphill Co., 12th and Etna Sts., Pittsburgh, manufacturers rolling mill equipment and other heavy machinery, plan extnsions and ihprovements in branch plant here, incl. installation of electric furnace and other equipment. Est. $85,000.

Pa., Philadelphia — Gimbel Bros., Broadway and 33rd St., New York, N. Y., will receive bids about Feb. 1, for the construction of a garage and service station, here. Abbott Merkt Co., 175 5th Ave., Archt. Noted Jan. 16.

Pa., Philadelphia—Outdoor Advertising Co., 18th and Noble Sts., awarded contract for a 1 story garage and service building at 25th and Stokley Sts. Estimated cost to exceed $40,000.

R. I., Newport — C. B. Lawton and A. J. Zing, will soon award contract for the construction of a 3 story garage, etc., at Marlboro and Branch Sts. Estimated cost $42,000. D. Shapiro, Globe Bldg., Fall River, Mass., Archt.

Tex., Corpus Christi—Alamo Iron Works, has work under way on the construction of first unit of plant.

Tex., Houston—Barnes Machine Shop, 1009 Washington St., plans the construction of a 1 story, 50 x 70 ft. machine shop at Navigation Blvd. W. Bordeau, Archt.

Tex., Houston—Houston Armature Works, 4 Preston St., awarded contract for the construction of a plant and office at Bastron and Prairie Sts. Estimated cost $50,000.

Utah, Salt Lake—Mack Truck Co., is having preliminary plans prepared for the construction of a garage. Estimated cost $60,000.

Utah, Salt Lake City — H. and W. Moyle, awarded contract for the construction of a 1 story, 165 x 169 ft. garage. Estimated cost $100,000. Ballard-Jackson Nash Co., lessee.

W. Va., Wierton—Wierton Steel Co., plans to expend between $6,000,000 and $7,000,000. Plans include No. 1 blast furnace to be rebuilt, increasing pig iron output by 150,000 tons annually, also additions to coke plant to increase production. C. H. Hunt, Ch. Engr.

Wyo., Sheridan — Chicago, Burlington & Quincy R.R. Co., 547 West Jackson Blvd., Chicago, Ill., is having plans prepared for the construction of a mill here. Estimated cost $80,000. A. W. Newton, Chicago, Ch. Engr.